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ABSTRACT

Intended for use by State vocational education directors and curriculum planners, this guide documents the results of a project which developed and applied a process for identifying new and emerging occupations for skilled and technical areas, part of a larger effort to assist the alignment of vocational and technical program offerings with new employment opportunities. The guide is divided into two parts. The first describes the process of identifying new and emerging occupations that was developed during this project and suggests how that process applies to program planning at the State, regional, and local levels. The second part (the major portion of the guide) presents the framework for the occupational guidelines and contains the guidelines for each of the new and emerging occupations identified through this study: Child Advocate, Energy Efficiency Technician, Halfway House Resident Manager, Horticultural Therapy Aide, Industrial Hygiene Technician, Nuclear Quality Assurance Inspector, Physical Security Technician, Podiatric Assistant, Crystal Manufacturing, Housing Rehabilitation Specialist, and Public Safety Communications Operator. Guidelines for each are presented under the following headings: Job Description, Summary Assessment, Employers and Occupational Setting, Student Considerations, Curriculum Guidelines, Information for Program Planning, and Conclusion. A listing of information sources for each occupation and a glossary of terms are appended. (HD)

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# Identifying and Planning for New and Emerging Occupations: A Suggested Guide

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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by

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1976

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## PREFACE

This guide was developed through a project for the U.S. Office of Education, Curriculum Development Branch of the Bureau of Occupational and Adult Education, under Part I of the Vocational Education Amendments of 1968. It is intended for the use of vocational and technical educators in identifying potential program offerings for emerging employment areas.

The guide documents the results of the project which developed and applied a process for identifying new and emerging occupations for skilled and technical areas. The project serves as part of a larger effort to assist the alignment of vocational and technical program offerings with new employment opportunities. This effort represents a major challenge to educators because of the difficulties in obtaining planning information for occupational areas which are not yet well-established.

For ease of reference, the guide is divided into two parts. The first describes the process of identifying new and emerging occupations that was developed during this project and suggests how that process applies to program planning at the State, regional and local level. The second presents the framework for the occupational guidelines and each of the new and emerging occupations identified through this study in detail. A listing of information sources and a glossary of terms are presented in the Appendices.

In addition to the principal authors, a number of people contributed to the development of this document. These include Barbara Boris, Kelly Gerry, Ralph Jones, Sharon Livesey and Ann Reed. U.S. Office of Education personnel responsible for the project were Dr. Walter Brooking, Project Monitor and William Berndt, Project Officer.

Alice K. Gordon
Project Director
March, 1976

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# PART I

## Chapter I

### INTRODUCTION

The success of good planning for vocational education depends upon the ability to be responsive to two major constituencies: students and employers. While student needs and labor market/occupational trends are fluid and dynamic, the elements of a vocational education system are necessarily more stable and less susceptible to change.

The identification of new occupations as they are emerging enables vocational and technical educators to be better able to plan program offerings in a systematic and cost-effective way. Employer needs for trained manpower, student needs for training in areas where there are employment opportunities, and society's needs for educational development in a changing technological environment should be anticipated and incorporated into program planning.

The Vocational Education Amendments of 1968 authorize the development of curricula for, and training in, new and emerging occupations. The purposes of this study were first, to develop and document a methodology and a process for identifying new and emerging occupations at the skilled and technical levels, and second, to identify specific examples of new occupations that met the criteria of "new and emerging" for which training might be offered in vocational and technical secondary and postsecondary institutions.

The results of this project should assist vocational and technical curriculum and program planners to identify new and emerging occupations and to develop curriculum and implement programs for them. Thus, in developing a process for identifying new and emerging occupations in skilled and technical areas, an attempt was made to follow a procedure that could be replicated by vocational and technical planners and others as an ongoing process. The key to this process is identifying the technological and societal trends that lead to new and emerging occupations, being aware of existing occupational data bases and labor forecasts, and most importantly, developing a wide range of contacts with employers, professional associations, labor unions, and other appropriate organizations to keep abreast of current developments in industry.

#### National vs. Regional Perspectives

This study was undertaken from a National perspective, and therefore includes some occupations for which there may be no demand in some of the States. Conversely, some new occupations have been excluded because they related to particular regional demands and were too specific to a given geographical area to be of general interest. The program planners can best assess the local potential and demand for program planning and curriculum development. This study serves as a guide, therefore, not a handbook, for State vocational education directors and curriculum planners.

## The Risk Factor

There is clearly an inherent problem in responding to the identification of new and emerging occupations for vocational program development. On the one hand, economic and technological progress is often so fast that new occupations become major factors in the economy within only a few years of their first introduction. The implication is that vocational program planning must be undertaken almost simultaneously with identification of new and emerging occupations.

However, the process for the identification of new and emerging occupations is exploratory and developmental in nature. Vocational program planners thus face the dilemma of having to plan early enough, while running the risk of committing resources and initiating programs for occupations which may not materialize.

In order to avoid the speculative commitment of resources, and at the same time insure that vocational education planners will be able to implement new programs before it is too late, it is essential that new occupations be identified early, that preliminary planning begin as soon as the new occupation has been identified, and that program planners continue to monitor the development of the new occupation, so that commitment of resources be timed with increasingly clear and reliable information that job openings will exist.

All change involves risk. The educational planner risks investment of human and material resources in a program which may, because of unforeseen technological difficulties, for example, be implemented before there is a real employment demand for the program. The planner also takes a risk in ignoring trends and not investing these resources -- only to find that an unmet demand exists.

Further, the process by which occupations emerge interacts with the vocational planning process. That is, the installation of training programs may hasten the adoption of new technologies, and/or reorganization of work.

The risk inherent in new program planning and implementation is mitigated somewhat by the expectation that five years is needed for planning, curriculum development, testing and final implementation of a new program. Constant monitoring of the trends, and consistent testing of program planning against indices of demand will allow the planner to reduce the risk of unwise investment considerably. There are few, if any, publications which will tell the program planner what new occupations are on the horizon. Instead, the process identified in this study requires the planner to keep in contact with industry, labor and government groups on an ongoing basis, and continually update and refine the information and planning in response to new developments.

## Definition of New and Emerging Occupation

For the purposes of this study, *a new and emerging occupation is one which has come into existence in the past ten years in skilled and*

*technical areas, for which there is an established demand, a basis for projecting growth, and a shortage of trained labor, and for which no public vocational training is available.*

Within this definition, given time and unlimited resources, a great many new and emerging occupations can be identified. Using the specific criteria derived from the definition, this study identified eleven occupations which are viable examples of new and emerging occupations, out of the total universe of possible candidates. These are real occupations, the demand for which is growing throughout the country, and serve to illustrate the process of identification and exclusion or inclusion for program planning.

The skilled occupations are: Crystal manufacturing -- Grower, Polisher, Fabricator, Assembler; Public Safety Communications Operator, and Housing Rehabilitation Specialist.

The technical occupations are: Crystal Technician, Podiatric Assistant, Child Advocate, Horticultural Therapy Aide, Physical Security Technician, Nuclear Quality Assurance Inspector, Industrial Hygiene Technician, Halfway House Resident Manager, and Energy Efficiency Technician.

The criteria, methodology and process, and outcomes resulting in this selection are discussed in the following chapters.

## Chapter II

### CRITERIA FOR NEW AND EMERGING OCCUPATIONS

Key criteria for identifying new and emerging occupations derive directly from the operational definition, i.e., that the occupation:

- must have emerged within the past decade
- is skilled or technical
- has an established demand leading to a basis for projecting growth and a resultant shortage of trained manpower
- has no public vocational training programs available.

These factors are interrelated and lead to three major criteria for identification and subsequent program development. These criteria are ordered for purposes of discussion as follows:

- No existing curricula - the educational preparation required should be significantly different from that offered in existing programs.

- Existing demand - equal to or greater than 2000 openings nationally, per year, and projected growth in the next decade.

- Length and level of preparation - a minimum of two months for upgrading, six months for a new trainee, and maximum of two years of preparation, leading to skilled or technical employment.

### No Existing Curricula

Where a new occupation has existing curricula which meet sufficient quality standards, the occupation was not included in the candidate pool. In this case, the planner tries to make the curricula available to programs desiring to implement them. Often, the training requirements for a new occupation represent a new "module" that might be inserted into already existing programs, or, parts of existing programs can be restructured to encompass all the necessary skill areas for a given occupation. The funding of new curriculum development efforts on a large scale is not necessary; rather, efforts can be made to modify existing curricula.

Therefore, for many of the occupations discussed in detail in Part II, it is suggested that existing courses be combined with new offerings in the creation of a "new" curriculum for a new occupation, but in fact, only parts of the total program are new.

### Existing Demand

In order to justify expending resources to develop curricula at the National level, there should be estimated demand in the identified occupations plus projected growth in demand of at least 2,000 jobs per year in each occupation over the next five to ten years. Demand figures are often the most difficult criteria on which to obtain accurate information. But even if relatively accurate demand estimates can be ascertained, it is important that educators are assured that employers will hire the graduates of new programs rather than drawing from the general labor market and providing necessary training on the job.

### Length and Level of Training

Jobs that do not require more than two months of re-training to upgrade employees already trained in related areas, or six months of training in the case of new employees, are excluded from this project. In these cases, on-the-job training or apprenticeship might be the more appropriate method of training. The maximum amount of education required should be no more than two years of postsecondary level preparation. That is, the training should prepare for occupations at the skilled or technical -- not the professional -- levels.

### Technical vs. Skilled Job Categories

In an article entitled Preparing Supportive Personnel for New and Emerging Technologies, Walter J. Brooking reasons that a "preparatory

curriculum [must be] a sequence of related courses..." including basic courses underlying the field, an "elementary course in the technique, procedures, processes and apparatus of the specialty, [and] succeeding course[s which] contribute to the depth and understanding of the student's skills and competencies in the specialty. Such a curriculum must provide the variety and depth of preparation...[necessary] to cope with inevitable changes that will occur in [the] special field." The immediate tasks and competencies in which skilled support personnel must be trained will be less complex than those necessary for technicians, but no less basic to the body of specialized knowledge in the field for which they are being trained.

Given these constraints, it seems most appropriate to differentiate "technicians" and "skilled" personnel in terms of training curricula necessary to prepare them for their respective jobs. This definition has, in fact, been applied by Dr. Brooking, who distinguishes technicians and skilled personnel as follows:

> "Technicians and other specialized supportive personnel... usually require 2 to 3 years of rigorous, specialized post high school education different from the first 2 years of a baccalaureate program.
>
> "Skilled workers in the field...are usually taught their specialized skills in a few months to a year in on-the-job orientation and training programs."

Technical training, thus usually includes a larger amount of classroom preparation, while a skilled worker's training tends to involve more hands-on work experience.

New and emerging occupations in areas where the Office of Education has recently supported vocational educational education curriculum development were excluded. Specifically, these were: Bio-Medical Equipment Technology; Electro-Medical Technology; Nuclear Medical Technology; Laser and Electro-Optical Technology; Pediatric Assistant; Para-Legal Education Curriculum; Courses in Laser Technology.

Out of some 100 other occupations considered, the following best met the criteria.

**Figure I: NEW AND EMERGING OCCUPATIONS**

| *Technical* | *Skilled* |
|---|---|
| Crystal Technician | Crystal Manufacturing: |
| Podiatric Assistant | Grower |
| Child Advocate | Polisher |
| Horticultural Therapy Aide | Fabricator |
| Physical Security Technician | Assembler |
| Nuclear Quality Assurance Inspector | |
| Industrial Hygiene Technician | Public Safety Communications Operator |
| Halfway House Resident Manager | Housing Rehabilitation Specialist |
| Energy Efficiency Technician | |

The process and methodology used to determine these as new and emerging occupations is discussed in the next chapter.

## Chapter III

### METHODOLOGY

Identifying new and emerging occupations entails a four-step process, beginning with the examination of broad trends that affect the general structure of occupations in U.S. society, and then focusing in on specific sources to test the degree to which a particular job title meets the criteria as a new and emerging occupation. These major steps in the identification process are to:

- isolate trends and processes affecting the emergence and development of new occupations
- identify occupational data bases and employment forecasts to designate occupational areas and specific job titles for further investigation
- develop alternative means for demand and growth rate estimates
- discuss with knowledgeable employers and or other organizational representatives data information on candidate occupations.

The combination of these four steps proved to be a useful approach in identifying numerous candidates for new and emerging occupations, although the steps do not always follow directly. Rather, the process is frequently more iterative; as one gathers certain information, candidate occupations are redefined and previous sources are consulted for corroboration.

#### Trends and Processes

In order to document the process by which new occupational areas emerge, established occupations and new occupational candidates were analyzed in order to isolate common elements. Four major processes were identified by which new occupations emerge. These are through:

- new legislation
- new technology, changes in technology, or new inventions
- job redesign or restructure
- social or institutional change.

These processes have combined as well as individual impacts and, therefore, must not be considered solely in isolation. Further, specific changes which result may be categorized as identifiable occupational trends.

##### *New Legislation*

New legislation, such as the Occupational Health and Safety Act, 1974, often requires technical and skilled personnel for implementation. Specific techniques, procedures and equipment required to meet with regulations produce a demand for trained manpower with new technical skills.

Further, implementation of new legislation may call for a different combination of skills from those demanded by existing programs. Monitoring the work environment, for example, requires new instrumentation and analysis skills in areas such as air and noise pollution, as well as trained personnel to plan and undertake operations. Moreover, knowledge of regulations is important and, with increased emphasis on safety in all aspects of the work environment, the demand for trained personnel in this area is increasing markedly.

*New Technology*

New technology in past years has included the electronic computer, numerically controlled machine tools, lasers, integrated circuits, and a number of improved plastics. Many other technical areas are currently available or rapidly being developed. Semiconductor technology, which will improve manufacturing and process control in many industries, has led to a number of new products. Large scale integrated circuits, for example, can perform functions with a single crystal chip that formerly required hundreds of transistors. New or improved technologies require training for the skilled and technical personnel necessary for operations, maintenance and sales positions.

*Job Restructuring*

The recent emergence of legal paraprofessionals is an example of job redesign or restructuring that results in new occupations with new education and training needs. This process is particularly apparent in professions which have personnel shortages at highly skilled or professional levels, but which allow delineation and delegation of particular tasks. Training necessary to perform these functions can be designed for a potentially large pool of supportive technicians and specialists.

*Social Change*

The recent trend toward deinstitutionalization in a number of fields is an example of social or institutional changes which create new occupations. Correctional, welfare, drug, juvenile and elderly services are continuing to move from large institutions to community-based programs. Often, in these areas prior "consumers" with "life experience" -- e.g., former drug addicts -- are employed without educational preparation.

*Interaction of Processes*

In addition to considering the four processes in isolation, it is also important to consider their interactions. New legislation, as in the OSHA example, often requires new technology in order to be implemented. Inversely, new technology may require new legislation and control. Examples may be generated for a number of other interactions, such as social change leading to new legislation, social change implying job restructure, and new technology requiring job redesign.

Any procedure for identifying new and emerging occupations should take into account the implications of these four processes and their interactions. On the other hand, these four processes alone are not

sufficient to identify new and emerging occupations. Rather, they provide a focus for the identification procedure. Trends in specific occupational areas must also be isolated. Investigation of occupational data sources for indicators of specific new and emerging occupational areas is a second important step.

### Occupational Data Bases and Employment Forecasts

For the second step in the identification process, National occupational data bases and employment forecasts were examined to ascertain whether the available data would provide evidence or serve as an indicator of broad social and technological changes which might alter the occupational functions in specific fields. These sources were examined to provide leads to new job titles and industries with labor shortages and projected growth that would indicate areas where further investigation might prove profitable.

A survey of major sources of manpower and occupational data revealed that there is no one systematic method of utilizing existing data sources for identifying new and emerging occupations. This is primarily due to the fact that each source of data is specific to the objectives for which it was gathered, and no data is currently collected for the purpose of identifying new and emerging occupations. Use of existing data sources is further limited by data gaps, lack of coordination of efforts, the comprehensiveness of data collected, levels of aggregation, and problems of job titles. Therefore, it must be recognized that there is no specific methodology for utilizing data sources in planning for new programs.

#### *Occupational Data Bases*

Four Federal occupational data sources were examined to determine if new job titles really implied new and emerging occupations to meet the criteria.

- Occupational Employment Statistics Program (Bureau of Labor Statistics) - Survey by industry of the types of occupations, and the number of employees in each particular occupation. A supplemental section of this survey suggests a listing of jobs which do not fit into categories as defined. It was hypothesized that some of the titles appearing in the supplement might represent new occupations.

- Dictionary of Occupational Titles (Employment and Training Administration, Department of Labor) - A comprehensive listing of existing occupations and related numerical codes. It was hypothesized that comparison of various editions might identify recently added occupational titles.

- Classified Index of Industries and Occupations (Bureau of the Census) - This document is produced every ten years and can be compared with the previous listings to determine what occupations have been added. It was hypothesized that these new occupational titles might represent new and emerging occupations with accompanying census data.

- Standard Industrial Classification (Office of Management and Budget) - A listing of industries by categories which can be compared with previous listings to determine if any new industries have been added. These new industries could then be investigated to determine if they contain any new occupations.

A comparison of these data bases shows that only the Occupational Employment Statistics Program (OES) potentially solicits new occupational titles. In the other three sources, new job titles can only be obtained by comparing the latest edition with a previous one to isolate new listings. Often these leads do not turn out to be new occupations. One reason for this is that many occupational data bases become more specialized over time. Thus, where one occupation had been listed, three occupations may appear in a later listing even though the job functions have not changed. A second and related reason for a new job listing not turning out to be a new occupation is that often job titles change without a corresponding change in job function. Further, the results of comparisons fail to distinguish real changes in job function from superficial changes in job title. New arrangements of listings, further breakdowns of job classifications, and assignment of new occupations to existing titles or codes further complicate this process.

*Employment Forecasts*

Two Federal employment forecasting sources were consulted in an effort to identify industries with labor shortages on the hypothesis that the shortage may result from new occupations with inadequate training to fill the existing positions or where occupational functions are changing.

- Occupational Outlook Handbook (Bureau of Labor Statistics) - Employment outlooks for selected occupations based on statistical and economic analyses.

- Division of Technology and Productivity (Bureau of Labor Statistics) - Studies to assess the impact of new technology on employment trends and patterns, usually in established industries.

These sources do not include projections for less established occupations because data necessary for statistical projections is not currently available for most new occupational areas. Nonetheless, though these sources mostly report on established occupations with labor shortages, occasionally they turned up "leads" meriting further investigation.

*Alternative Means for Developing Estimates*

Although "hard" data for demand and growth rate projections cannot be obtained for new and emerging occupations, it is possible to develop alternative bases for demand and growth rate projections. The basis for most projections for which solid data is not available is usually data on rates of production and consumption, sales, funding patterns, employment in related fields, and documented rates of change.

In addition, demand estimates for future employment categories can also be predicted from analysis of growth trends and employment figures in goods and services closely related to the new occupation in question. Further, in social service occupations, the funding prospects in particular areas must be considered since social services in particular rely on sources of funds tied closely to highly unpredictable political and economic developments.

Demand estimates for the new and emerging occupations contained in this report combine the above-described methods of demand forecasting with reliance on knowledgeable experts and substantiating evidence. As such, they are presented with considerable caveats concerning the strength of the data.

### *Discussions with Knowledgeable Individuals*

After potential new and emerging occupations were identified from the sources above, knowledgeable individuals were heavily relied on to further refine the information on specific occupations. It became apparent that Federal and State agencies, associations, industry and union representatives, and education and research centers were the best sources of information on new occupations, new or growing industrial areas, new technology, and further sources to be contacted. By following a simultaneous process of contacting individuals and locating data from various sources, we were able to supply information for each candidate occupation then identified. In particular, Federal employees who were responsible for preparing and maintaining the occupational data bases and employment forecasts described previously provided fruitful leads to areas for further investigation, even though many of the occupations considered had been too new for inclusion in various publications because of lack of data or of available training.

## Constraints

Of particular importance in identifying new and emerging occupations is the recognition of several constraints which apply to the process. First, the perspective adopted will determine certain fundamental parameters for defining new and emerging occupations. Adopting a National rather than a regional viewpoint automatically determines that some potential occupations will be excluded from consideration despite the fact of high demand for workers in that occupation in certain regions.

Second, projected demand is a critical issue in designing any new occupation for curriculum development since faulty demand projections may result in:

- Few employment opportunities for students - Until a new occupation is adequately established in an industrial setting, trained students will be unable to find employment opportunities.

- Misallocation of resources - Resources will be misallocated if they are used to develop curricula for occupations which have not yet demonstrated a demand for new workers.

Yet, despite their importance, estimates of demand and growth rates in new and emerging occupations are difficult to derive. Since "hard"

data, such as manpower analysis generated by input-output matrices, do not exist, extrapolations must be made on the basis of existing data (e.g., consumption rates, funding patterns, employment in related fields) and expert opinion. Necessarily, certain caveats must be applied in using this kind of data.

### *Need vs. Demand*

As stated above, knowledgeable individuals in the field are an important source of data on new and emerging occupations. In deriving demand estimates from these sources, it is important to maintain the distinction between "need" and "demand." "Need" really describes a particular employer's or group of employers' point of view: it applies to a perceived requirement for workers in a particular area. "Demand" however, is an objective description applying to an actual number of job market openings. Demand tends to take into account long-range as well as short term considerations.

The significance of this distinction must be emphasized. Employers may overestimate the real demand with inflated projections which would lead to a flood of the job market and a subsequent depression of wages. In order to avoid the bias of employer "need" in estimating job demand, it is important to contact many sources for estimates on any given occupation.

### *National vs. Regional Perspectives*

As stated above, regional and National perspectives differ. Therefore, data sources -- whether people or publications -- must be checked for regional bias. Demand for solar energy collector installation may skyrocket in a geographical area where Federal funds support this new technology, for example, while in other areas there will be no demand for a long time. Thus, it would not be feasible to develop curriculum for solar energy technicians on a National basis.

### *Other Biases*

Estimating employment demand in new and emerging occupational areas on the basis of information from knowledgeable individuals in the field implies that they understand the definition of "new." Misunderstanding this term leads to faulty estimates of the amount of new training required different from that which already exists. Thus, it is important to discover the nature of the skills involved in "new" areas in order to avoid mistakes of definition. For example, the skills involved in the solar technician's job are not new skills, they are old skills applied to a new purpose. Therefore this occupation was excluded after research determined this factor. A comparison of information from multiple sources helps to reduce bias.

# Chapter IV

## APPLYING THE METHODOLOGY

One step in selecting new and emerging occupations involves the identification of processes likely to create new occupations. These processes produce in turn new occupational areas and trends. By analyzing these trends, one can pinpoint specific new and emerging occupations which offer potential for curriculum development.

### Public Policy and Legislation

Some of the most important public policy decisions are National, for example, the new policies in relation to energy, but there will be different impacts in different States. In some States, new industries or new jobs may be created, but these will not be uniformly distributed across the Nation. Other public policy decisions occur at the State level. For example, in spite of the fact that there are Federal laws on environmental protection, States have their own laws in this area, some which go beyond minimum Federal standards. In other areas, e.g., consumer protection, States have been innovators. In general, regulatory policy was most conducive to the creation of new jobs in the areas of:

- safety and health
- environmental protection
- energy conservation
- energy production
- rights of individuals in institutions
- consumer protection.

Other policy decisions that may be important include those which provide funding for new Federal programs in areas such as:

- housing
- social service delivery
- mass transit
- energy research and development.

### Technological Change

Some areas where new technology may be a factor include

- semiconductor and related industries
- computers and computer applications
- nuclear power and applications of nuclear technology
- energy
- transportation
- business equipment.

Not all new technologies create new occupations appropriate for inclusion as new and emerging. On the other hand, new technologies may not only create new industries or new production processes, but also may create changes in marketing and distribution. Furthermore, they may create changes in old industries, or they may create the need for job

restructuring. The effects of new technologies are often felt only in a given region, and their impact must be tested locally.

### Restructuring of Jobs

Job restructure usually occurs when (1) a new production process is introduced; or (2) supportive technicians are trained to perform certain job components previously handled by professionais.

Examples of areas where this is likely to occur include:

- hospitals and health care
- industries introducing new technology
- financial or research institutions
- social agencies.

### Social and Institutional Change

Even without government regulation or subsidy, there may be changes in social service delivery. New services may be created; others may change. The areas where these changes are most likely to occur are:

- health and hospitals
- social welfare (e.g., services to new groups)
- institutions for the elderly, mentally ill or retarded, etc.
- education (e.g., special education, adult education)
- recreation (as there become new forms of recreation).

The four major factors are interrelated. For example, new technology may lead to new production processes in a manufacturing industry, thereby contributing to job restructuring. Similarly, technology may be a catalyst for new legislation; or vice-versa. Legislation also may mandate social or institutional change, or even job restructuring. Social and institutional change also may contribute to job restructuring as managers of new institutions create new procedures for service delivery.

### Occupational Trends

In considering the interrelationships among these trends and processes, the new and emerging occupations which met the criteria and those that were rejected may be grouped into five categories. These categories are:

- Energy and the Environment
- Security and Quality Assurance
- Semiconductors and Computers
- Social Services
- Health

#### *Energy and the Environment*

This trend is the product of a decade of growing concern about the scarcity of natural resources. The National energy crisis resulted in rapid mobilization of efforts to preserve scarce natural resources and

to stimulate technological change to enable the economy to utilize other less scarce resources to meet its energy needs. At the same time, a longer-range, but related effort is underway in the field of environmental protection to prevent further degradation of other scarce resources: water, air and land.

Since this trend is best characterized by growing public concern, it is logical that legislation should be one of the primary change factors. The legislative efforts of the last decade, finally consolidated in the mandates of the U.S. Environmental Protection Agency, the Federal Energy Administration, and the Energy Research and Development Administration, contributed to major efforts in both the public and private sectors to conserve natural resources and develop new sources of energy. Specifically, regulation to preserve natural resources, coupled with research efforts that would contribute to the efficiency of those efforts, produced new industries and new jobs. More recent legislation related to energy has been even more concerned with new technology, not only to find and utilize new sources of energy, but also to make more efficient use of existing sources.

The job of energy efficiency technician, therefore, is the result of both legislation and technology.

*Security and Quality Assurance*

The convergence of trends in the areas of safety, security and quality control represent not only increased concern with the problems they represent, but also a recognition of the degree to which the industries dealing with these problems share common technologies and structure. One of the common themes represented by all three is protection of persons and property; another is loss control. Like energy and the environment, this trend is the result of both legislative and technological change. The legislative changes are those in areas of consumer protection and safety and health. Technological changes have created some of the problems in this area (where new technologies create new potential hazards) but they also have been utilized in meeting these concerns (e.g., new testing and monitoring devices which reduce loss or monitor potentially hazardous operations).

One example in this area is physical security technician. Armed with new technological skills to meet the expanded needs of industrial security, the physical security specialist can analyze security problems and then implement an appropriate security system. The other occupation selected in this area, nuclear quality assurance inspector, is an occupation created by the potential hazards associated with both the increased use of nuclear technology, and also by the increased recognition of the hazards associated with any production process that involves nuclear materials.

*Semiconductor, Computer and Related Industries*

More than any other technological change in the past decade, the semiconductor is the best example of the potential of an invention to revolutionize a variety of industries. Crystal manufacturing produces and processes the silicon and germanium crystals that are the crucial raw

material used in the production of semiconductors. Starting with electronic devices such as pocket calculators, the semiconductor soon generated a host of related products that affect a number of markets. One of the most important of these is the microcomputer (or microprocessor) that utilizes the semiconductor to replace the magnetic core used in traditional computers. The potential of the microcomputer is enormous, not only in the field of computers, but also in computer applications. For example, because of its size, the microcomputer may soon replace mechanical or electro-mechanical devices in a variety of consumer goods, from micro-wave ovens to automobiles. It already has been used in industry in computerized production processes.

Although the emerging societal need for improved safety and security affects the development of the public safety communications officer, this is a "new" job that resulted also from the restructuring of the communications process in public safety after that process began to utilize the potential of computer-aided communications. An example is the increased use of computer-aided dispatch of public safety vehicles through which the communications officer can: receive a request for assistance; use the computer to identify the most appropriate vehicle available to provide assistance; dispatch that vehicle; and then provide the computer with new data about the location of that vehicle which affects allocation decisions in response to the next request for assistance.

### *Social Services*

New occupations in the social services have emerged because of legislation which mandates new social programs, or changes in existing social programs, or because of innovations in the administration of social service delivery systems, responding in large part to social and institutional changes. For example, the housing rehabilitation specialist is a person employed by local governments to implement rehabilitation and community stabilization programs, which have accounted for over half of the expenditures by local governments under new community development legislation administered by the Department of Housing and Urban Development. The horticultural therapy aide is a new and emerging occupation that developed from a new type of psychological therapy utilizing horticulture, available to individuals in a variety of institutions. The halfway house resident manager is an occupation that developed as legislation and changing social concepts sought to remove individuals from large institutions and place them in smaller community-based facilities. The child advocate developed as legislation and judicial decisions increasingly recognized the rights of children and the need for skilled individuals to represent them.

### *Health*

Health care is one of the fastest-growing sectors of the economy. Although there have been a number of technological advances in medicine, for which training has been quickly developed, there are still new and emerging occupations for which there is no training. One of the new and emerging occupations in this area is podiatric assistant, an occupation that was created by increased demand for podiatric services, and the recognition by podiatrists that some of the functions necessary in treatment of patients (e.g., production of orthotic devices) could be assumed

by assistants, thus freeing the podiatrist for diagnostic and prescriptive activities. The second occupation, industrial hygiene technician is directly linked to safety and health legislation, the Occupational Health and Safety Act of 1974, particularly to those aspects of the legislation that related to health hazards.

*Interrelated Trends*

It should be clear, from the discussion above, that there are many occupations that are the result of more than one trend. For example, the public safety communications operator is associated with growth in the safety area as well as the development of new technologies utilizing computers. Similarly, the industrial hygiene technician is related to health, but also to legislation in the general safety and security area. The convergence of trends may well be one of the most important sources of new and emerging occupations.

This interrelationship is illustrated in Figure II which follows:

**Figure II: NEW OCCUPATIONS BY CATEGORY AND TRENDS**

| Category | Occupation | New Technology | Legislation | Social or Institutional Change | Job Restructuring |
|---|---|---|---|---|---|
| Energy & Environment | Energy Efficiency Technician | ● | ● | | |
| Security & Quality Assurance | Physical Security Technician | ● | | | |
| | Nuclear Quality Assurance Inspector | ● | ● | | |
| Semiconductor, Computer, & Related Industries | Crystal Manufacturing | ● | | | |
| | Public Safety Communications Officer | ● | | | |
| Social Service | Housing Rehabilitation Specialist | | ● | | |
| | Horticultural Therapy Aide | | | ● | ● |
| | Halfway House Resident Manager | | ● | ● | |
| | Child Advocate | | ● | ● | |
| Health | Podiatric Assistant | | | | ● |
| | Industrial Hygiene Technician | | ● | | |

**Excluded Occupations**

There were a number of occupations within these five categories which turned out not to meet the criteria of this study (see Figure III).

From a National perspective, there were several reasons why they were rejected as potential new and emerging occupations. A change in perspective might have resulted in a different outcome.

One of the criteria that might be expected to vary signficantly across States was "insufficient demand." If the potential growth in a particular occupation was less than 2,000 new hires, it was rejected. Since occupations often are clustered regionally, however, this may be too rigid a standard to apply to a State program.

Another criterion used was that the occupation was not new, i.e., adequate curricula already existed for this occupation. Examples of jobs that were not new, but where there was high demand are: wastewater treatment plant operator and nuclear qualified welder. In each of these cases, some employers may reject the notion that existing curricula are adequate. Modifications in curricula to assist these employers in filling positions may be needed.

The air pollution technician was excluded because educational programs for this occupation exist in many areas. In the case of a certified fertilizer applicator, training for this jcb takes less than six months. Conversely, the educational program needed for the product liability technician extends beyond the two or three year guidelines presented in the enabling legislation. Some occupations have obvious potential but are "too new," and technological procedures from which the occupations derive have not yet been widely adopted by industry, e.g., the microprocessor technician.

Figure III indicates the wide range of occupations excluded for these reasons. All of the occupations considered, except those determined as new and emerging,will be found in Appendix A.

| FIGURE III:<br>SAMPLE REJECTED OCCUPATIONS | Insufficient Demand/Growth | Existing Curriculum | Insufficient Length of Training Required | Too Much Training Required | Too New | Not New |
|---|---|---|---|---|---|---|
| **ENERGY AND ENVIRONMENT** | | | | | | |
| **Wastewater Treatment Plant Technician**<br>Performs complex procedures to analyze influents, treatment processes and effluent characteristics. Determines treatment charge to industrial polluters. | | ● | | | | ● |
| **Wastewater Treatment Plant Operator**<br>Manages, plans and oversees treatment plant operation. Must be able to make decisions on treatment, budget, purchasing, maintenance. | | ● | | | | ● |
| **Sediment Control Inspector**<br>Collects water samples and performs analysis of sediment levels. Uses monitoring devices on-site. | ● | | | | | ● |
| **Sediment Control Specialist**<br>Reviews plans and construction for potential effects on sediment control. | ● | | | | | ● |
| **Chemical Spill Control Technician**<br>Performs various types of field work in order to remove chemical spills on land or in water. | ● | | | | | ● |
| **Power Reactor Technician**<br>Operates computer console in nuclear power plant, maintains operation at maximum efficiency, detects malfunctions. | ● | | | | | |
| **Solar Energy Technician**<br>Installs solar energy components. | ● | ● | | | | |
| **Noise Abatement Technician**<br>Tests for noise levels from aircraft, trucks, and other sources, writes reports, makes compliance recommendations. | | ● | ● | | | |
| **Air Pollution Technician**<br>Collects and analyzes air samples, monitors air pollution levels, writes reports. | | ● | ● | | | |
| **Pyrolysis Technician**<br>Monitors system, adjusts oxygen, gas and influent flow in a process to obtain methane gas from solid waste material. | ● | | | | ● | |
| **Certified Fertilizer Applicator**<br>Aids farmer in correct application of fertilizers and insecticides. | ● | | ● | | | |
| **Heat and Power Engineer**<br>Maintains efficient operation of large building, involving heating and cooling, energy conservation, plumbing, electrical work, fire control systems. | | ● | | | | |
| **Nuclear Qualified Welder**<br>Performs a variety of welding techniques, primarily heliarc, to exacting federal standards. | | | | | | ● |
| **SAFETY, SECURITY, QUALITY CONTROL** | | | | | | |
| **Safety Technician**<br>Assists safety professionals enforce compliance with safety standards, makes routine inspections, investigates accidents, prepares reports. | ● | | | | | |
| **Public Safety Communications Technician**<br>Installs and maintains communication systems, including multi-purpose, computer-based system. | ● | | ● | | | |
| **Security Officer for Transportation Centers**<br>Inspection and maintenance of security standards at transportation boarding facilities. Knowledge of self-defense, sensor devices, and weaponry is essential. | ● | | | | | ● |
| **Ballistician**<br>Records serial numbers and identifies weapons, identifies projectile characteristics, provides expert evidence in court. | | ● | ● | | | ● |
| **Holographic Technician**<br>Operates and maintains holographic and conventional photographic equipment. Develops and prints film. (Holography is three-dimensional internal photography using laser technology to inspect for structural defects.) | ● | ● | ● | | | |

| SAMPLE RUECTED OCCUPATIONS | Insufficient Demand/Growth | Existing Curriculum | Insufficient Length of Training Required | Too Much Training Required | Too New | Not New |
|---|---|---|---|---|---|---|
| **SAFETY, SECURITY, QUALITY CONTROL (con't)** | | | | | | |
| **Product Liability Technician**<br>Tests products for defects involving chemical, engineering and other technical processes. Prepares technical and legal data. | | | | ● | | |
| **Quality Assurance Technician**<br>Identifies, audits and samples various procedural steps in the delivery of services in order to reduce errors. Analyzes flow of information. | ● | | | | | ● |
| **Standards and Calibration Technician**<br>Consults to industries where standardization and calibration of testing equipment is important. Reduces discrepancies among testing procedures. | | | | | | ● |
| **Chromatography Technician**<br>Operates equipment and follows procedures to separate, identify and quantify known or unknown compounds for purposes of analysis. | ● | | | | | |
| **SEMICONDUCTOR, COMPUTER, AND RELATED INDUSTRIES** | | | | | | |
| **Microprocessor Technician**<br>Installs and services computer (microprocessor) used in consumer appliance and machines. | | | ● | | | ● |
| **Data Communications Manager**<br>Oversees communications systems, including data processing, in telephone, satellite, computer, and telecopier. | | | | ● | | |
| **Tape Librarian**<br>Maintains library of computer tapes, catalogues, recycles, evaluates tapes. | ● | | | | | |
| **Cable TV Technician**<br>Installs cable TV systems, manages system. | ● | | ● | | | |
| **Media Equipment Technician**<br>Distributes, maintains audio + video equipment used in medical education. | ● | | | | | |
| **SOCIAL SERVICES** | | | | | | |
| **Community Development Officer**<br>Serves as community coordinator of relocation, rehabilitation and neighborhood conservation. Is responsible for communication and liaison of community development programs. | ● | | | ● | | |
| **Historical Preservation Interpreter**<br>Gives visitors detailed information on historic sites. | | | | | | ● |
| **HEALTH** | | | | | | |
| **Homemaker/Home Health Care Worker**<br>Provides homemaker and health care services to individuals and families with physical or emotional problems. | | | | | | ● |
| **Diagnostic Medical Sonographer**<br>Performs a variety of technical procedures involving ultrasound equipment to diagnose disease, evaluates ultrasound scans. | | ● | | | | |
| **Tissue Culture Technician**<br>Maintains tissue cultures in laboratory, using microscopes or incubators. | | | | | | ● |
| **Fundus Photographer**<br>Assists ophthalmologists by taking fundus photographs, develops photographs, explains them to patients and other medical personnel. | ● | | | | | |
| **Production Specialist for Medical Instruction**<br>In charge of photography, illustration and writing of medical materials to be used in education of patients, in legal proceedings, and for other instructional purposes. | | | | | | ● |
| **Nephrology Assistant**<br>Administers medication, maintains kidney machine, administers blood transfusions and assists in surgery. Patient-contact skills are required. | | ● | | | | |
| **Kirlian Photographer**<br>Operates kilan apparatus by which patterns emanating from body, produced on administration of a small jolt of electricity and as yet of an unknown nature, are photographed. | | | | | ● | |

# Chapter V

## GUIDE FOR THE STATE PLANNER

Currently, data is not collected and disseminated to meet the informational needs of education planners in new employment areas. As this study indicates, there is no systematic process that can be universally applied to identify and document new and emerging occupations. It is impossible, therefore, to establish here a step-by-step procedure for direct application by the State planner. With modifications in focus and criteria, however, the process developed in this study can be adapted to fit the objectives of State planners. Likewise, the process can be modified for use at the regional and local levels.

### The Process

As described in Chapter III, the process for identifying new and emerging occupations involves four key elements: (1) isolation of trends and processes with impact on new occupational areas; (2) use of occupational data bases and employment forecasts to pinpoint new areas and specific job titles for further investigation; (3) development of alternative means for demand and growth rate estimates in new areas; and (4) discussion with knowledgeable employers and other organizational representatives.

Establishing demand projections and determining the preparation necessary for employment in new occupational areas are critical factors in this process. Further, this type of data is most likely to be subject to local and regional variation. Diversity in local and regional demand, as well as the conditions which govern collection of data in this area, are major considerations in modifying the new occupation identification process for use by State planners. Thus, precaution must be taken to develop a sound information base to use in tailoring the process developed in this study to State and local definition and criteria.

### Information Sources

Most planners are already aware that the larger educational planning process must be supplemented by information to assess the risk and benefit involved in implementing new programs, as opposed to more established ones. Further, the information gathering process itself yields contacts for an Advisory Committee to assist in decision-making, development and installation of new programs.

Past experience shows that no single source of information is adequate for planning purposes. In the case of new and emerging occupational areas, where very few hard facts are available, the use of multiple information sources is particularly necessary.

DEVELOPING AN EXPANDED NETWORK OF INFORMATION SOURCES IS THE KEY TO PLANNING FOR NEW AND EMERGING OCCUPATIONS.

A good information network involves:

- expanded contact with employers
- identification and use of multiple information sources
- identification and use of data bases.

The most important source of information is employers. The term employers here is used in the broadest sense; that is, to refer to business and industry; public and private sectors; scientific, professional, and trade associations; unions and other organizations. Large organizations covering a number of areas provide the means for tapping an expanded network of employer contacts. State economic development agencies, for example, are concerned with all employment areas within a State and may have surveyed the labor needs of the State. The State associations of manufacturers might be another important source of employment information in a number of areas. This information could be useful to the identification process.

In all cases, information from larger organizations of employers should be supplemented with data from occupation-specific groups. For example, associations representing firms in a particular industry would be most useful once a particular trend within the industry was identified. Equally helpful are professional associations and labor unions since these organizations understand the nuances of specific kinds of labor shortages and may assist in refining the job functions and training requirements.

An important consideration in collecting information from employers is the realization that employers often have vested interests affecting their points of view. It is also often the case that employers' reactions to perceived economic conditions affect their judgments about demand estimates. An expanded employer contact network and accumulation of information from multiple sources will greatly reduce the biases in information gathered from individual employers.

Additionally, published data sources which collect employment information should be used to substantiate or repudiate employer information. Sources which are the State counterparts of the National data bases examined in this study may provide useful data. New Dictionary of Occupational Titles codes, systematically compiled by the State, for example, would provide one source of possible new job titles. Further, many States conduct a regular survey of employers which provides indications of new occupational areas within the State as well as planning figures.

### Refinement of Information

Updating sources of information, important in any planning effort, is particularly critical in the area of curriculum planning for new and emerging occupations. Over time, information sources doubtless change as older sources are superceded. In any case, existing sources must be

supplemented to avoid gaps and discrepancies in data. Further, legislative, social, technological and occupational developments are continually shaping new trends in employment which must be consistently documented.

Thus, it is important to corroborate older information with fresh data in order to keep abreast of new developments and insure that shifts in the demand for a given occupation are considered. For example, developmental changes in the application of new technology can change future demand and training requirements even before the technology is put into operation. Furthermore, mechanisms such as employer surveys must be updated to indicate changing demand, new samples drawn, and so forth. Lastly, as the membership in employer groups, professional societies, education, training, and planning associations changes, so must the information network. The planner should be particularly careful to identify entire new local groups such as Governor's or Mayor's advisory committees, new industry groups or even new scientific and professional organizations.

Planning for new and emerging occupation curriculum development depends heavily on the planner's sensitivity to indices of change. Since information in this area does not exist in a "pre-packaged" format, creativeness in identifying potential new data sources will also lead to more effective program design. Particularly important for the State planners is an ability to discern local and regional trends in contrast to new developments at the National level. Thus, the State planner is advised to consider the new and emerging occupations presented in Part II of this report as possible new program offerings as well as examples of the application of the process at the National level.

# PART II

## Chapter I

## GUIDELINES FOR CURRICULUM DEVELOPMENT AND PROGRAM PLANNING

The remainder of this report presents descriptions of the eleven skilled and technical occupational areas identified in this study. The purpose of these descriptions is to provide a framework for curriculum development and decisions related to program planning.

The occupation descriptions are organized into seven sections, each containing specific elements of information. These sections are:

- Job Description
- Summary Assessment
- Employers and Occupational Setting
- Student Considerations
- Curriculum Guidelines
- Program Planning Information
- Conclusion

A listing of sources of information by occupation is provided in Appendix C. A brief description of the particular information included in each section follows.

### Job Description

Job titles are often misleading and/or ambiguous. For this reason, every attempt was made to determine the specific functions that distinguished that job from any other. Other functions which occur frequently are included.

Job descriptions are presented as succinctly and precisely as possible with further information about the context of the job, or any unusual considerations appearing in other sections.

### Summary Assessment

For each job an assessment of the basis for projections and the strength and limitations of the data available are summarized in this section. Conditions, such as reliance on a new technological development or social or economic trend affecting the occupational outlook, and any caveats that ought to be considered in making decisions about further development, are indicated.

Demand estimates, growth projections, and an analysis of the trends that indicate the newness and size of the occupation are included in the information presented in this section.

### Employers and Occupational Settings

This section describes the types of employers and places of employment for a particular occupation, both for further explanation of the job context and to provide an idea of the possible sources of information necessary for curriculum development and program planning. The employers and associations mentioned are useful for the identification of potential Advisory Committee members.

### Student Considerations

Included in this section is information needed by students in order to make career decisions and to decide on enrollment in a program. This information is also necessary for program planners in considering recruitment of students. Discussed here are factors such as work environments, salary scales, occupational mobility, any special restrictions (e.g., ex-inmates, handicapped), prerequisites for admission to a training program (e.g., high school diploma, mechanical aptitude), licensing or union requirements, among others.

### Curriculum Guidelines

This section deals with factors to be considered in the planning of a curriculum, and includes courses or topics to be covered. A distinction between existing and new areas of study is made where possible. In addition, information is provided as to the nature of the training: its suggested length, whether it leads to a certificate, a license, or an associate degree, and methods of training are recommended (for example, classroom, cooperative, laboratory). The curriculum content is presented schematically according to performance objectives and course or topic titles.

### Information for Program Planning

Included here is information needed by a planner in deciding whether it is feasible to institute a training program for each particular occupation. New equipment and materials are discussed with reference to availability, cost and the possibility of contributions from prospective employers. Personnel and equipment considerations are highlighted. The program is considered in relation to a variety of prospective purposes: as preparation for new employees, as refresher or upgrading courses, and as preparation for related occupations.

### Conclusion

Important considerations are highlighted and summarized in this last section.

Detailed descriptions of the new occupations follow, arranged alphabetically by technical and skilled categories.

# Chapter II

## SELECTED NEW AND EMERGING OCCUPATIONS

### CHILD ADVOCATE

*Technical*

**Job Description**

A child advocate works directly with children and/or parents in a problem-solving capacity pertaining to the provision of relevant social services or to questions of legal privileges. The advocate provides to children with unmet needs the most appropriate resources in the shortest time possible and ensures that information, referral, and advocacy service are available and easily accessible to all children in the jurisdiction.

The basic functions provided by a child advocate include:

- providing information - collecting and disseminating information to individuals and agencies regarding the availability of resources
- referral - providing assistance to those seeking help in selecting and using the most appropriate resources
- follow-up - maintaining contact with the client and agency to which the referral was made to determine whether the client is continuing to receive the service requested
- enhancing community awareness - maintaining records which will help identify unmet needs, duplication of services, or gaps in service.

**Summary Assessment**

The growing concern for programs dealing with children is being demonstrated by the mandates for procedural changes and increased funding in recent federal legislation in the areas of special education, services to the handicapped, and juvenile corrections:

- The Mathias Amendment to the Elementary and Secondary Education Act (P.L. 93-380) of 1974 ensures protection for children in institutions and calls for the least restrictive setting for children requiring special care. This is to ensure that children with special needs will be integrated with other children to the greatest extent possible.
- Recent enabling legislation in the area of education for the handicapped (Education of All Handicapped Children Act of 1975, P.L. 94-142), to become effective in 1978, will fund educational programs for handicapped persons and provide assurance that proper evaluation, assessment, and placement will occur. Title XIX of the Social Security Act also deals with procedures for children in institutions.

- The Supreme Court has also played a key role by extending constitutional rights to children. The Court has held that children are "persons" under the constitution (Tinker v. Des Moines School District, 393 U.S. 503 (1969)); that children in juvenile court are constitutionally entitled to certain due process guarantees (In Re Gault, 387 U.S. 1 (1967)); and that the constitutional rights of black school children are violated by segregated education (Brown v. Board of Education, 347 U.S. 483 (1954)).

Institutions that deal primarily with children are beginning to reorient their services to reflect these new attitudes. Particularly in the fields of corrections and services for the mentally and/or physically handicapped, child advocacy is a growing concern. However, there is much professional debate on the merits of the advocacy approach, and on the scope of activities that should be undertaken by an advocate. This situation is partially caused by the fact that a person labelled as an "advocate" may actually be performing functions normally undertaken by a therapist, social worker, legal counsellor, or street worker. In general, however, there is a clearly defined and unmet function that the child advocate can perform.

**Employers and Occupational Setting**

A child advocate may be employed in any setting where children's rights are at issue, but typically works either in juvenile corrections, or in conjunction with programs for the mentally or physically handicapped. In both areas, the employment setting should be an independent state or municipal regulatory agency because the advocate's primary responsibility is the interests of the child. The interests of the child may be different from, and possibly in conflict with, the practices of the institution where the child is receiving services.

In juvenile corrections, there are three main settings where the advocate is employed:

- Juvenile Court System. Here the advocate ensures that the juvenile obtains proper defense, and monitors referrals to ensure that the services being provided best meet the particular needs of the offender.

- Community Residential Facility. In community-based residential treatment centers for juveniles, the advocate serves on the staff to provide liaison between the youth and community institutions. Here the advocate assists in having the local institutions provide more adequate services.

- The Community. Following the street worker model, the advocate assists in the preventive effort at the neighborhood level.

A child advocate working primarily with the mentally or physically handicapped fits into a number of different settings:

- Community Residential Facility. As in corrections, community-based residential treatment for the institutionalized handicapped is growing. The advocate provides input towards establishing programs to meet the needs of the children, and works as a liaison with community agencies to integrate the child into the community.

- Schools. Recent special education legislation in many States mandates that adequate programs be established within schools to meet the needs of students with special problems. The advocate sees that regular assessment of children occurs so that they may be enrolled in the proper program.

- Private Setting. In many of the instances described above, the child advocate works in a private setting, as an adjunct to a team of lawyers or social workers on a fee-for-service basis. In this setting, the advocate does much of the legwork in ensuring that the child is being provided with proper assessment and treatment.

Because of the variety of settings in which a child advocate can work, the funding for such programs comes also from a wide variety of sources. On the Federal level, recent legislation (Public Law 94-142) calling for programs and assessment for handicapped children would provide funds for advocates. The Juvenile Justice and Delinquency Prevention Act of 1974 provides funds to states for development of programs to focus on delinquency prevention and community-based treatment. Depending on individual state juvenile justice plans, some of these funds could be used to fund advocate positions. Another possible source of funding to be explored is the Bureau of Education for the Handicapped, U.S. Office of Education.

On the State and local level, youth services departments are a source for funding and administering child advocacy programs. State Welfare Departments and vocational training programs also fund child advocates in some states. State associations for retarded citizens and similar citizen coalitions are lobbying agents and also potential funding organizations.

### Student Considerations

A fundamental qualification for the child advocate is a commitment to children and to social change. The advocate constantly interacts with both clients and social service institutions and must have great patience in attempting to resolve issues. Much contact with the children, their parents, and local public officials is needed for successful performance. It is essential that the advocate be able to relate to the background and the underlying problems of the client. In the field of corrections, the best advocates tend to be persons in their early twenties who have had some exposure to the corrections system. In dealing with the handicapped, the clients tend more often to be parents, and the consensus is that, if they had proper training, parents of handicapped would make the best advocates.

As in most social service occupations, the wage scales for this profession tend to be low. For a graduate of the curriculum described below, entry-level salary would probably be around $8,000. The salary could increase with time on the job, and related experience to between $12,000 and $14,000.

It is possible that many of these positions at the State or municipal level would be filled by civil servants whose positions are being phased out. Furthermore, especially during periods of reduced public funding and/or recession, child advocate positions are frequently filled by recent graduates with baccalaureate degrees. This situation would limit openings and depress salaries for those with only the associate degree.

Advancement would take the form of assuming supervisory and administrative functions. Given the extensive contact with social service agencies, the skills learned from child advocacy are readily transferable to management of a wide range of social service activities, such as case management in welfare agencies or juvenile probation departments. Child advocacy also serves as a stepping stone into social work, law, or management and administration of social service systems when the appropriate educational requirements are met.

**Curriculum Guidelines**

Many junior colleges and community colleges across the country are beginning to offer a generalized course sequence for paraprofessional training in human services. At present, there are between 150 and 200 institutions offering some form of this curriculum. The sequence lasts two years and covers general skills plus some field placement. Since background skills in human services are essential to the effective practice of child advocacy services program, an obvious location for a child advocacy curriculum would be as a specialist option within this two year curriculum

The general component of the human services curriculum should cover skills* in the following areas:

- Interpersonal relations - forming positive relationships with clients, families, fellow workers, supervisors, the community.
- Communications - basic and professional language skills, including oral, written, and non-verbal.
- Work management-work time by priorities of duties and operations, coordinating responsibilities to various clients.
- Group management-a range of functions from the more mechanical housekeeping and supervision functions to acting as therapeutic agents.

* Topics of this curriculum appear in A Case Curriculum for Entry and Middle Level Workers in Human Services Agencies Report prepared by the Human Services Manpower Career Center (Washington, D.C.: U.S. Department of Labor, June 1971).

- Interpretive-evaluative observation, recording and evaluation of the meaning of behavior.

- Helping - various therapeutic techniques such as counseling, coaching, crisis intervention, behavior modification, and activity therapy.

A majority of the second year of training should be focused on issues relating more specifically to child advocacy, as detailed in the following section.

**Child Advocate Specialization Curriculum**

A child advocate should be well versed in a range of legal issues and know where to obtain legal opinions regarding children's rights. This knowledge permits the advocate to determine when the child's rights are in danger of being violated, and the proper steps to pursue in clarifying new rights and privileges. There are three functional areas around which this section of the curriculum should be structured: delinquency and corrections, special education, and mental health/handicapped. It may be advantageous to encourage students to specialize in one of these areas within the child advocate curriculum, depending on the employment opportunities in a particular region.

| CHILD ADVOCACY CURRICULUM |
|---|
| Objective: The student will demonstrate an understanding of legal issues regarding children's rights. |
| Topics: Statutory rights of children<br>Relevant Federal and State legislation<br>Judicial process and trends; current state of decisions<br>Courts and probation systems<br>Process for establishing rights: court action vs. legislation vs. administration change |
| Objective: The student will demonstrate familiarity with difficulties faced by children with special problems or developmental handicaps. |
| Topics: Child psychology/socialization<br>Forms of treatment/trends<br>Types of disabilities<br>Development of the exceptional child |

| | |
|---|---|
| Objective: The student will show an understanding of the political and bureaucratic structure of local government and mechanisms for enacting change. | |
| Topics: | Settings for social service delivery<br>Where and when to seek expert advice<br>Negotiation skills<br>Programmatic change - where to make changes in a program |
| Objective: The student will demonstrate familiarity with the advocacy approach. | |
| Topics: | History/theory/practice of advocacy |

The curriculum should be supplemented by practice including field experience in a local advocacy agency.

**Information for Program Planning**

Given the existence of a human service generalist curriculum, the establishment of a child advocate specialty does not present many problems. Most of the areas of training offered within a child advocate speciality are already available at the community college level.

Three new instructional areas that should be added to supplement the program would require:

- A person familiar with the child care area to coordinate the program
- A lawyer familiar with the legal issues regarding children's rights
- A practicing child advocate versatile in the theory of advocacy.

If no such curriculum exists in an area, there are some organizations, such as the Southern Regional Education Board in Atlanta, Georgia, that could provide advice in organizing a program. This curriculum also could be helpful to practicing child advocates to supplement their on-the-job learning, or to persons in a related field who wanted to become involved in child advocacy.

## Conclusion

The recent emphasis on expanding and protecting the rights of children has led the provision of advocacy services. The child advocate performs a variety of functions in a variety of settings, which is the main reason for the bright prospects of this occupation. The two-year human services curriculum offers excellent opportunity to add a fourth semester specialty in child advocacy. Some ambiguity exists as to the setting in which advocacy services are to be delivered. The providers of social service are beginning to re-evaluate their role regarding how an advocacy function relates to the delivery of other traditional services. However, the force of legislation and the existing social trend toward recognition of civil rights and rights to services for children indicate that the child advocate will be a commonly recognized role in the future.

## ENERGY EFFICIENCY TECHNICIAN

*Technical*

### Job Description

Energy Efficiency Technicians assess heating, ventilation, air conditioning (HVAC), and lighting systems to insure efficient energy consumption. They provide technical support to builders, contractors and graduate engineers in energy conservation planning for new buildings, retrofitting requirements for existing structures, and monitoring of energy usage in building complexes.

### Summary Assessment

The diminishing supply and high cost of petroleum products has created changes in national, state and local policy. Conservation of current energy sources and the development of new sources of energy (solar, wind, nuclear) is viewed as a National need, and Federal funds amounting to billions of dollars are being allocated for the efficient use of existing energy sources and the development of new ones. These efforts must be considered in conjunction with another new National policy, that of environmental protection.

All new buildings have already been affected by energy conservation needs. For example, the National Bureau of Standards has promulgated new regulations concerning the quality and thickness of insulation materials which must be used in all new structures. These and other regulations apply not only to the largest building complexes but to the single family dwelling as well.

A recent survey of Federal government agencies indicated that great amounts of time, money and human energy are being expended in an effort to disseminate energy conservation information to various audiences. It is clear that this effort is having limited success, at least outside the scientific and professional community. The problems of builders, building owners, managers and tenants are not solved by exhortations to "Turn off the lights" and "Cut down the thermostat." Other more sophisticated measures are needed. Assistance can be obtained through the services of an engineering consultant. But consultants are expensive, there are not enough of them, and their skill level often overqualifies them for the problem at hand. An energy efficiency technician qualified to recommend, install or retrofit equipment can often solve these problems.

An article in Business Week (January 19, 1976) noting the serious demand for engineers in the United States, projected the need for 2,000 engineer-managers in Houston, Texas, alone. It is clear that some of the tasks of engineers could be factored out and performed by the energy efficiency technician.

Although some representatives of engineering consultant firms feel that only graduate engineers can do the job as described, others already employ "engineering aides" to provide assistance to the graduate engineering

staff. One source, head of a large downtown building project in Detroit, Mich., estimated that 400 such technicians could be employed this year in Detroit alone. Although building starts are down and large-scale urban renewal projects have been cut back due to the recession/inflation, most large United States cities have extensive future building plans. A conservative extrapolation from the Detroit example suggests that some 14,000 new energy efficiency technicians could be employed throughout the country.

There are numerous studies and programs in energy conservation being conducted through the country. The Aerospace Corporation is studying energy conservation in the public housing sector to ascertain how much energy waste can be reduced by modifying the different physical and management structures of large urban apartment complexes. Colleges and universities are conducting studies which aim at a 30% reduction in energy use on campuses. In New York City, perhaps the largest educational user of energy with more than 1,000 schools, the Board of Education commissioned a study to survey energy use in the city schools: among the findings was that "a simple operations manual for the maintenance staffs of the schools, could result in significant energy savings." The field visits, computations, and much of the information generated in such studies could be accomplished by the energy efficiency technician.

The National Environmental Policy Act of 1968, and subsequent legislation, requires all applicants in most industrial categories as well as others to submit an environmental impact assessment before building permits can be granted. There is a relationship between the environmental protection requirements and energy conservation needs and often assistance is required in complying with both sets of regulations on a specific site.

The National Science Foundation (NSF) is supporting a wide range of projects in "innovative technology," including solar, wind, geothermal and other energy forms. Building is a $135 billion industry in the United States and the NSF is attempting to advance solar heating and cooling technology towards an industry-based and commercially rewarding enterprise. TRW Systems, Westinghouse and General Electric have begun systems studies that should lead to proof-of-concept experiments to convert the nascent technology into hardware systems. NSF has also retrofitted schools as visible solar energy demonstrations.

In another thrust, NSF has funded work which has funneled solar power to electrolytic cells to generate hydrogen, so that solar plants become fuel manufacturing facilities rather than power plants per se. NSF projects the following: "With solar power and a hydrogen economy, solar energy could, and likely will revolutionize the way in which electrical power is generated, transported and used."[1]

In all large building complexes there is a need to reduce energy consumption. The responsibility falls upon the plant superintendents

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[1]National Science Foundation, Mosaic, Vol. 5 (Spring, 1974).

and managers who are not usually graduate engineers, and there is a dearth of training opportunities for plant maintenance personnel to learn how to reduce energy consumption and save costs.

As with most newly emerging occupations, the need for energy efficiency technician is more easily substantiated than the demand.

### Employers and Occupational Setting

There is a wide range of potential employers in both the public and private sectors, for example, within State and local building complexes, public housing authorities, health complexes, shopping centers, high-rise apartment buildings, colleges and universities, and with contractors, builders and engineering firms.

There is also a large variety of associations to which the employer and/or the employee relate. Among these are:

- American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE)
- Association of Physical Plant Directors in Colleges and Universities
- The Building Owners and Managers Association (BOMA).

### Student Considerations

Students need have no unusual physical strength or unusual characteristics for this job. There is no reason why women cannot perform the job. Handicapped persons, such as parapalegics, could be employed in a number of jobs in offices - such as those now employed as "engineering aides" in engineering consulting firms. Prior educational preparation in vocational or technical high schools would be an asset.

In some settings, and as a result of collective bargaining agreements, the wages and salaries for this occupation are good, with entry-level salaries beginning around $10,000. Depending upon the size of the installation, members of a "physical plant department" number from 3 to 100 people, within which there are several grades of technical proficiency.

Energy efficiency technicians who are recognized as such by virtue of the training given and certification received should be able to gain employment in a variety of settings, and the job offers opportunity for interoccupational mobility. Requirements for various licenses, for example, in HVAC (heating, ventilation and air-conditioning) can be met through educational programs and these licenses assure the students of immediate employment as skilled workers, should the technician jobs not be immediately available.

The energy efficiency technicians can work in plants, buildings, hospitals, schools, within both public and private sectors in both "blue" and "white" collar settings, depending upon the employment possi-

bilities available within the geographical region. With education experience and general acceptance of the job as a discrete occupation there will be advancement opportunities within the next several years.

**Curriculum Guidelines**

There are both old and new components of the proposed curriculum. Much of the course material listed below is already presented in vocational/technical institutions and these components need only an emphasis on energy conservation to be included in the program for energy efficiency technician. For example, the technician must not only be well-grounded in HVAC, but also know how to monitor energy systems and costs attributable to energy use and to understand the general design requirements for new energy- efficient buildings.

Most well-equipped vocational and technical institutions will already have the bulk of the equipment needed for the program. Exceptions may be in new computer applications and solar energy. It is in the interest of computer manufacturers such as IBM and Honeywell, who are developing these new technologies and applications, to cooperate with such a program, and these companies can provide both training and equipment resources. Federal funding is available for a wide range of solar energy programs.

The curriculum can be designed so that the sequential components and specific courses can be of help to plant superintendents and engineers already employed, so that the total program can lead to licensure, certification, and the associate degree, and so that students may elect to continue into a graduate engineering program or to seek immediate job placement upon completion of the program.

Much of the technician's work depends on the computational accuracy and it is suggested that passing a qualifying examination in mathematics be made a condition of entrance to the program.

| COMPONENTS NOW OFFERED IN VOCATIONAL/TECHNICAL INSTITUTIONS | |
|---|---|
| Objective: The student will demonstrate an understanding of energy sources and of the skills involved in energy use. | |
| Topics: | |
| College Algebra & Trigonometry | Mechanics (Statics) |
| Calculus | Engineering Graphics |
| Physics | Principles of Computer Programming |
| Fluid Mechanics | Mechanics (Dynamics) |
| Heat Transfer | Stress Analysis |
| Heat Engineering | Thermodynamics |
| | Engineering Design |

| NEW COMPONENTS | |
|---|---|
| Objective: The student will use theory and practice to solve energy conservation problems. | |
| Topics: | |
| Principles of new energy systems<br>Solar<br>Wind<br>Nuclear<br>Ethical issues | Monitoring energy systems<br>State Building Codes<br>EPA Regulations<br>Cost Accounting |

**Information for Program Planning**

To establish this program successfully, there must be acceptance of the technician on the part of the engineering community. The program will train a group of middle-level technicians who can perform some of the work now being done by engineers and, on the other hand, also handle tasks of greater complexity than maintenance personnel. There is such a wide variety of settings within which the energy efficiency technician can be usefully employed that the major problem for educational planners is to develop a curriculum in close conjunction with employer needs in the region. It is suggested that one way to accomplish this is to form an advisory committee composed of representatives of large building development companies, engineering consulting firms, and labor and industrial representatives from manufacturing companies which have large plants and therefore large energy requirements. Representatives from professional associations and unions should also form a part of such committees.

The curriculum should be developed in consultation with such committees. Prospective employers represented on these committees should also be asked to assure employment of the program's graduates within reasonable limits, and offer opportunities for hands-on practical experience and/or field placement during the course of training.

There are a remarkable number of resources for curriculum development in this area. ASHRAE, BOMA, and other associations, labor unions, and Federal agencies such as the Federal Energy Administration, the Energy Research and Development Administration, and others, have offices specifically related to dissemination of material about new technology, and are developing a mass of materials which might be useful to introduce into components of the curriculum. The components which treat new technologies related to energy, as well as those which treat new monitoring techniques

of energy consumption, should be designed so that plant superintendents and others can participate in these classes and apply their new knowledge immediately to their day-to-day responsibilities.

Although the curriculum guidelines indicate that a significant percentage of the learning will be theoretical rather than practical, it is recommended that half of the training be hands-on, in the field, or with simulated equipment in order to avoid further expenditures in OJT and also to assure the immediate employment of the persons who complete the program.

**Conclusion**

A significant number of sources in both the private and public sectors, as well as representatives from federal agencies expressed a good deal of positive interest in this new occupation. Consulting engineers expressed a realistic concern that the occupation be defined clearly so that it is understood that the technician is an assistant to the graduate engineer.

Assistants are already employed as aides in drafting, drawing up specifications, etc. and it appears that further help in monitoring energy usage could be of great value to the graduate engineer. The occupation of energy efficiency technician will be accepted because of the National concern with energy-related problems. The need is obviously here; if our National energy problems continue - and it is likely that they will - the demand for such trained technicians will be created once it is known that they are available.

## HALFWAY HOUSE RESIDENT MANAGER

*Technical*

### Job Description

The halfway house resident manager is responsible for the day-to-day operations of the facility: ensuring that equipment is maintained, keeping records, collecting rent payments, etc. To adequately manage the daily routine and support ongoing treatment, the manager must demonstrate familiarity with the therapy techniques utilized in the halfway house. Other related job functions include staff supervision, community relations, fundraising, and serving as a role model and advocate for the residents. Many of these job functions may vary among halfway houses, depending on specific job responsibilities in specific settings.

### Summary Assessment

The extensive growth of halfway houses is due to the recent emphasis on decentralizing the operations of correctional and other institutions. The number of community-based corrections homes has grown quickly in the past five to ten years to the present level of over 2,000 facilities in the U.S. This growth is not expected to continue at its present rate, but there is consensus that community-based correctional facilities are here to stay. This trend toward community-based delivery of services also includes juvenile and adult mental health facilities, alcohol abuse centers, drug abuse centers, and others. The duties performed and training needed by a resident manager in any of these other programs are essentially the same as in the halfway house.

Even though the number of halfway houses has grown, turnover of staff and facilities has been high. Staff turnover is caused by relatively low pay, long hours, and the considerable commitment needed by staff. The instability of these facilities, which may result from funding problems, is attributable in no small part to inadequate management and budgetary practices at the individual house level. The typical halfway house manager has moved up through the corrections system, but has never been formally exposed to basic accounting or managerial techniques. Thus, a curriculum to train halfway house managers would be at least as useful for upgrading current managers as for initial training of new managers.

Other considerations that will affect the future of halfway houses are effects and costs associated with halfway houses as compared to other forms of correctional facilities. Studies of recidivism rates in halfway houses, the traditional outcome measure for correctional programs, are inconclusive. Costs, on the other hand, have generally proven to be much lower in halfway houses than traditional facilities and this is an important consideration in predicting future growth.

### Employers and Occupational Setting

Halfway houses can be either private or public institutions. Public halfway houses are components of State or municipal corrections agencies and house offenders either for a period before they are eligible for parole, or in lieu of traditional institutionalization. Private halfway houses serve similar clients, and either contract their services with public corrections agencies, or obtain outside sources of funding. Often funding for a particular halfway house is obtained from a variety of sources. Sources that have traditionally provided funding for halfway houses include:[1]

- Public financial resources, which include block funds from LEAA, HEW or State Planning Agencies (SPA) grants, contracts with the Federal Bureau of Prisons and Division of Probation, State Departments of Corrections and probation and parole authorities.

- Private financial resources, which include funding from sources outside the criminal justice system such as private agencies and individuals, and client payments for room and board; and

- Non-financial resources, which include community resources which provide free or reduced cost services to clients of halfway houses, e.g., doctors, lawyers, dentists, repairmen, and volunteers.

The halfway house resident manager generally is responsible to the halfway house program director. Halfway houses, especially those that have been in existence for a while, can be part of a larger chain of halfway houses. Within a chain, budgeting, fundraising, and community relations tend to be handled by a centralized administration. This affects the staffing functions at the individual houses.

In most halfway houses residents are expected to pay a portion of the cost from earnings.

### Student Considerations

Managing a halfway house is an extremely demanding and emotionally draining occupation. The manager is often expected to put in long hours in constant contact with the residents, as well as serve as general troubleshooter for all of the physical problems of the house. The halfway house manager also serves as the mediator between the residents and the community, i.e., as an advocate for the facility in the face of often hostile neighbors and unsympathetic social service institutions.

A halfway house manager must be able to deal with the client offenders. This takes a firm individual who is able to command authority. About

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[1] Cost Analysis of Correctional Standards: Halfway Houses American Bar Association, November, 1975.

one-fourth of the present halfway house managers are ex-offenders, and there is consensus that this is a positive development. At the very least a halfway house manager should be well acquainted with the criminal justice system.

The wage scales tend to be low considering the amount of effort expected of halfway house managers. For a person without extensive work experience but with some training, entry level salary is $5,500 to $6,500, plus room and board. Without room and board, entry level salary is closer to $9,000.

With increased experience, the resident manager could assume greater responsibilities in the operation of the halfway house. With experience and an advanced degree in corrections (usually master's level), the resident manger could advance to executive director or administrator within a network of halfway houses, with a salary of $15,000 to $16,000. The experience gained is directly applicable to managing a variety of other community-based residential programs in mental retardation, mental health, juvenile corrections, alcohol, or drug abuse programs. The halfway house manager could also apply skills gained in a halfway house setting to a position in the administration of a variety of state and local social service agencies.

There is a movement underway to certify halfway houses in the field of the treatment offered and thereby standardize the quality of services delivered. Certification, where applicable, is handled under the auspices of the American Correctional Association. Professional counselors in halfway houses are occasionally certified, but to date resident managers have not been. There exists consensus that, although they should demonstrate basic managerial and budgetary skills, managers should not be certified for fear that certification requirements would hinder innovation in the field.

### Curriculum Guidelines

A program in halfway house management should be designed to upgrade persons already in the field and to train persons with little experience in halfway houses. For those with little experience, the curriculum would include one year of classroom training, and one half to one year field placement. Ideally, a graduate of the curriculum would first work as an assistant resident manager in a larger facility, to learn more day-to-day management skills while providing technical expertise (e.g., recordkeeping, bookkeeping) to the program. For those presently working in a halfway house setting, a one year sequence should be offered at night or on weekends, with a flexible curriculum tailored to the individual's needs and job setting.

The curriculum should cover three broad areas: management, treatment, and community relations. The ideal setting for such a curriculum would be a community college that offered programs in both business administration and counseling or human services. The specific skills covered under the three broad areas are summarized below.

| CURRICULUM COMPONENTS |
|---|
| Management<br><br>Objective: The student will demonstrate the skills to plan and direct the operations and activities of a residential program.<br><br>Topics: Management of the physical facility<br>Supervision of personnel and staffing policies<br>Budgetary/accounting<br>Recordkeeping |
| Treatment<br><br>Objective: The student will demonstrate familiarity with the causes, prevention and correction of criminal behavior.<br><br>Topics: Relevant modalities of treatment - transactional analysis, reality therapy, rational therapy<br>Client needs<br>Goals of community residential treatment<br>Job development and placement |
| Community Relations<br><br>Objective: The student will demonstrate the skills to establish and maintain effective working relationships with public officials and the community.<br><br>Topics: Overview of the criminal justice system<br>Communications skills<br>Public relations<br>Structuring a community liaison program |

Field placement in a local halfway house is a valuable supplement to the coursework described above. The practical experience will give the student knowledge of the halfway house environment and a chance to develop techniques for working effectively in such an environment.

## Information for Program Planning

The major professional organization in this area, the International Halfway House Association, has favored the development of a program to train halfway house resident managers, while the Regional Institute of Community Residential Treatment Centers in St. Louis has run conferences to provide an overview of skills needed by halfway house managers. Both of these are invaluable sources for implementing and promoting a curriculum.

The most appropriate place for locating this program is in a local community college that has established programs in business administration and/or counseling or human services. The curriculum would be a specific combination of these two disciplines as applied to halfway houses. This program should maintain close contact with local halfway houses in an effort to provide practical experience for students, and keep abreast with new developments in the field in order to provide sufficient continuing education in the area of halfway house management.

## Conclusion

The recent emphasis on the deinstitutionalization of various populations has resulted in many more halfway houses. All signs point to a continuation of halfway houses as a locus of treatment but, of course, the degree of funding available is a critical variable. Program planning for preparation of managers, therefore, must take into account the availability of public funds, upon which job openings largely depend. The functions performed by the resident manager depend upon the degree to which certain functions are centralized within the house, and the specific job responsibilities within a halfway house, which vary considerably.

## HORTICULTURAL THERAPY AIDE

*Technical*

### Job Description

The Horticultural Therapy Aide carries out indoor or outdoor horticulture programs with a variety of populations, most often in a group setting, under the supervision of a professional horticultural therapist. The aide is a specialized teacher, who uses plant material to help physically, mentally and emotionally handicapped individuals to improve their emotional attitudes through a changed self-concept, their social skills through non-threatening interaction with others, and their physical skills through activities requiring both gross and fine motor coordination, and to improve their vocational and intellectual skills. Activities include landscape installation and maintenance, floral design, flower and vegetable garden management, artificial-light gardening, nursery production (trees and shrubs), and a range of activities in a greenhouse.

When there is no professional horticultural therapist, the aide's responsibilities may range from supervising the institution's plant store to designing programs. Participation in staff conferences is required of all aides.

### Summary Assessment

From a professional point of view, horticultural therapy is in its infancy. Garden club volunteers who have been doing this work for decades have gradually been replaced by trained horticulturists, and they are beginning to give way to trained horticultural therapists. Although there are now a small number of baccalaureate programs available in horticultural therapy, the majority of them offer degrees in horticulture with a few courses related to therapy. There is only one associate degree program in the United States, begun in 1975, for which the curriculum is still being refined.

Practitioners in this field report a great deal of interest in their programs on the part of other institutions: they receive many inquiries and have many visitors. Horticultural therapy workshops and conferences throughout the country are consistently attended by more people than their organizers expect.

Demand figures are, however, difficult to estimate due to the lack of data on horticultural therapy. Data collection is hampered by the fact that horticultural therapy can be used for many purposes: recreational therapy, occupational therapy, vocational therapy, and physical therapy.

There are some parallel figures available for these fields but even these are not satisfactory. For example:[1]

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[1] Statistics were taken from American Occupational Therapy Association, Health Resources Statistics. (Washington, D.C.: Department of Health, Education and Welfare, 1974); Occupational Manpower and Training Needs (Bureau of Labor Statistics, 1974); and a study in process for the Bureau for the Education of the Handicapped, HEW.

- There were 5,000 trained occupational therapists and 6,000 untrained occupational therapy aides in the 1974 work force.
- Employment of occupational therapy assistants is expected to grow at a rate of 160.9% by 1985, and that of physical therapy assistants and aides by 141.7%.
- A 1975 survey of ten types of Illinois employers of two-year recreational therapists reports that employers expect to hire 22.3% more of these workers in 1980 than they did in 1975.

When we turn to statistics on horticultural therapy itself, the figures are less specific:[2]

- A 1968 study of selected hospitals, primarily mental health institutions, indicated that 64% had some sort of "garden therapy."
- A recent survey of 7 prospective Maryland employers of horticultural therapy aides showed all of them were prepared to hire them.
- 67% of a sampling of adult correctional institutions surveyed in 1970 had either a formal or an informal horticulture program.
- A 1973 study of 100 mental hospitals revealed that 81% of them used horticultural therapy as part of the treatment program.

Other information, comes from interviews with people involved in horticultural therapy: employers, practitioners and professors in four-year horticultural therapy programs. Most reported many inquiries about their programs and about the availability of horticultural therapists, at both the professional and aide levels. Horticultural therapists report that a wide range of institutions are becoming increasingly aware of the value of using plants as a therapeutic tool.

### Employers and Occupational Settings

The range of employers for horticultural therapy aides is unusually broad. They include:

- Old age and nursing homes
- Schools and homes for the retarded

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[1]Statistics were taken from Rhea McCandliss, paper available from the National Council for Therapy and Rehabilitation through Horticulture; Belva Jackson, Charles County Community College and Melwood Horticultural Training Center, Md.; Nora Louise Hunter, Unpublished paper, California State Polytechnic College; Herbert Plankinton, Horticulture as a Work Program for Therapy, M.A. Thesis, University of Delaware.

- Institutions for the mentally ill and emotionally disturbed
- Correctional and rehabilitative institutions for youthful and adult offenders
- Schools and homes for the physically handicapped and sensory impaired
- Private and public hospitals for the chronically and acutely ill
- Veterans Administration hospitals
- Community centers for inner city residents
- Centers for alcohol and drug abusers
- Half-way houses

Programs now exist in each type of institution, both public and private, large and small. Most of them are supported in varying degrees by Federal and State funds. The National Council for Therapy and Rehabilitation through Horticulture is the clearinghouse for employment information, and has a limited job bank service.

**Student Considerations**

There are no physical prerequisites for a horticultural therapy aide. Indeed some sources indicated that the physically handicapped therapist serves as a role model in some institutions. A high school diploma or the equivalent might be necessary before admission to the educational preparation program. Manual dexterity is a prerequisite, coupled with an interest in both plants, and in helping people.

Currently, no license is required of the horticultural therapy aide. The National Council for Rehabilitation and Therapy through Horticulture is presently exploring the possibility of creating a registration procedure.

The horticultural therapy aide can expect to work with a variety of populations, and each group presents specific challenges, satisfactions and difficulties. In mental institutions or prisons there is a possibility of violent behavior by residents. In most cases, the work is emotionally strenuous, requiring a high degree of emotional stability on the part of the aide. Outdoor horticultural activities involve hard physical labor and exposure to the weather. In the greenhouse and in the fields, fertilizers and pesticides are dangerous chemicals when misused. The aide works constantly with other people, individually or in groups. The aide must be sensitive but not overly so, aware of unspoken feelings and needs, diplomatic, compassionate and patient. The aide must have an equal enjoyment for people and plants.

The entry-level salary varies greatly with the type of employer and the geographical location; the range is between $7,000 and $10,000. The salary for an experienced aide who has no further formal academic education may range from $11,000 to $14,000. Many factors cause differences in salary:

- Variations in cost of living through the country
- Variations in the level of responsibility accorded to the aide
- Variations in pay scales between public and private institutions.

There is, therefore, salary variation, which is not always predictable.

Without further academic training, the aide could, with extensive supervised experience, assume responsibility for a greater proportion of the horticultural therapy program (for example, in a large institution with an extensive horticultural therapy program, the aide could be in charge of all instructional activities, all greenhouse activities, all outdoor activities, etc.), and could ultimately supervise the entire program. With teacher certification, salary would be higher and advancement would probably be faster. With bachelor's or master's degree studies in accounting, management, psychology, or the discipline most appropriate to the employment setting, an administrative position is possible. A master's degree in horticultural therapy at one of the few schools now offering this program could lead to a career in horticultural therapy research.

Concerning interoccupational mobility, the skills learned in a two-year horticultural therapy program could be of use if the aide chose to become a horticulturist, either commercial (garden stores, seed and plant company testing sites, etc.) or educational (botanical gardens, National Park Service, etc.). One could teach horticulture at community centers or in adult education courses. On the other hand, education in therapy could be used as an entrance to a wide range of counseling activities.

### Curriculum Guidelines

The special nature of horticultural therapy resides in the fact that it is a combination of horticulture and therapy, both of them old and established disciplines for which curricula are widely available. The interface of these two disciplines, i.e., the ways in which horticulture can be used for therapeutic goals, is new. Traditional horticulture focuses on thriving and healthy plants, whereas horticultural therapy is concerned with people, who receive therapeutic treatment using horticulture as a tool. The program therefore consists of three parts: horticulture, therapy, and the new component of horticultural therapy. Practical experience is considered essential to the success of the educational preparation.

Sources agree that the length of the education program should be two years, including three to six months work experience. The horticultural therapy component represents roughly one semester of the total program. The academic training could lead to an associate degree.

Suggestions for curriculum topics are summarized in the following charts.

| COMPONENTS NOW OFFERED IN VOCATIONAL/TECHNICAL INSTITUTIONS |
|---|
| Horticulture |
| Objective: The student will demonstrate a knowledge of indoor gardening principles and procedures. |
| Topics: Greenhouse procedures<br>Soils<br>Pest Control: pathology and entomology<br>Plant identification and propagation<br>Floral design<br>Elementary botany |
| Objective: The student will demonstrate a knowledge of outdoor gardening principles and procedures. |
| Topics: Vegetable production<br>Soils<br>Pest Control: pathology and entomology<br>Flower garden management<br>Pomology (fruits)<br>Nursery management |
| Therapy |
| Objective: The student will demonstrate a basic knowledge of elementary psychology and sociology. |
| Topics: Psychology, including group dynamics<br>Sociology<br>Human Development, including child behavior |
| Objective: The student will demonstrate a knowledge of the mental, physical and emotional problems of special need groups. |
| Topics: Abnormal psychology<br>Special education<br>Physiology of handicaps<br>Recreation therapy |

NEW COMPONENTS

Objective: The student will differentiate horticultural procedures appropriate to the special needs of particular groups.

Topics:

HORTICULTURAL THERAPY

Horticultural therapy I & II
Garden and landscape therapy
Problems in Hort. Therapy
Practical experience

For example, possible horticultural therapy topics are illustrated in the list that follows, developed in Herbert Plankinton's masters thesis on horticultural therapy in mental institutions.[1]

Projects relating to indoor activity; to outdoor activity; group projects; passive activities for the withdrawn or seclusive patient; activities for the anxious, suspicious, depressed or overactive patient; activities which increase self-esteem; activities dealing with social values; creative activities for alert and overactive patients; quieting activities; activities which are monotonous tasks; activities which provide for the patient's exhibitionist needs.

**Information for Program Planning**

Establishing an educational preparation program for horticultural therapy aides is much simpler if the school already has a horticulture program. In this case, all of the equipment is at hand, and the instructors in the horticultural portion of the program are available (or can be identified through membership in the American Horticultural Society). If the school has a psychology or therapy department, these instructors could also be used in the new program.

When facilities are available for use by horticultural therapy students there will be low additional equipment costs. Otherwise, it is estimated that material resources will amount to $40,000 to $50,000, exclusive of land.[2] Acreage must be sufficient for a greenhouse, related buildings (e.g., a tool shed), and for outside activities.

Surplus equipment can be obtained from the federal government, large corporations, and classified advertisements. Horticultural magazines occasionally contain notices of existing unused greenhouses available at no cost other than that of dismantling and removing the

[1] Ibid.

[2] Of course, following purchase of equipment and material, establishment of an additional program in traditional horticulture would be inexpensive.

structure; however, labor costs and costs for replacing broken glass can, in some areas, make this a more expensive alternative than buying a new greenhouse. Tools, plants and seeds can be obtained at the lowest cost from large wholesalers.

Curricula for horticulture courses and therapy courses are readily available at a number of community and four-year colleges in every state. Horticultural therapy courses are a different matter: even at four-year colleges with degrees in horticultural therapy (or degrees in horticulture with a minor in therapy), the procedure is often that the student is trained in horticulture and in therapy, but not in the relationships between the two disciplines. The National Council for Therapy and Rehabilitation through Horticulture has information on available horticultural therapy curricula. If the planner must create a syllabus for horticultural therapy courses, it is advisable to contact horticultural therapists working in a variety of therapeutic milieus. Instructors for the new horticultural therapy component of the curriculum should ideally be current practitioners of the profession.

The two-year program proposed in this discussion would provide a general framework for those entering the field of horticultural therapy as well as selected courses serving as a refresher program for people moving from one therapeutic environment to another. The program might also prove valuable for traditional horticulturists who wanted to use their skills in programs serving people with special needs, or for established occupational, physical or recreational therapists interested in starting a horticultural therapy program at their institutions.

In surveying local job demand, a planner should pay particular attention to the need for two-year versus four-year people in horticultural therapy.

### Conclusion

In summary, the major barrier to program establishment for the occupation of horticultural therapy aide is the lack of reliable demand data. Another realistic consideration is that institutions which hire horticultural therapy aides often operate on small budgets, which in time of economic recession can be a severe problem. This last factor is partially offset by public funding for a number of institutions. Notwithstanding these caveats, institutional administrators are increasingly aware that horticulture is a valuable and effective therapeutic tool. Programs to prepare horticultural therapy aides are needed to fill their labor needs.

## INDUSTRIAL HYGIENE TECHNICIAN

*Technical*

### Job Description

The Industrial Hygiene Technician typically works under the direction of certified professionals providing needed support in the design and maintenance of healthful work environments. The technician monitors such potential health hazards as noise levels, the use of chemicals and caustic substances, air pollution and radioactivity, and keeps accurate records of findings.

### Summary Assessment

The need and demand for Industrial Hygiene Technicians is recent and acute, and is paralleled by the need for occupational health personnel at all levels.

| | |
|---|---|
| Present census of occupational health and safety personnel[1] | 38,800 |
| Present deficit of occupational health and safety personnel[1] | 31,200 |

| | |
|---|---|
| Current demand for industrial hygiene technicians [2] | 10,000 |
| Projected ten year need for industrial hygiene technicians[2] | 50,000 to 100,000 |

It is estimated that five to ten technicians could be employed for every professional currently employed in industrial hygiene, i.e., doctors, nurses, certified hygienists.[2]

The standards set by the Occupational Health and Safety Act of 1970, Public Law 91-596, have caused many employers to re-evaluate their practices in the area of employee health and safety. This re-evaluation has led, in turn, to an increasing need for qualified health and safety personnel in the private sector.

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[1] Health and Work In America: A Chart Book, (Washington, D.C.: American Public Health Association), p. 87.

[2] Personal conversation with a professor, College of Medicine, University of Iowa, Iowa City, Iowa.

Current trends indicate that both government and industry are growing increasingly concerned with preventive measures for the health and safety of people in the working environment, as opposed to concentrating only on the dollar value of lost time accidents and job-related injuries and hazards.

### Employers and Occupational Setting

Industrial hygiene technicians are needed in the private sector as well as public agencies concerned with monitoring and enforcing government regulations.

At present, technicians are most typically employed by the Occupational Safety and Health Administration (OSHA) and the National Institute for Occupational Safety and Health (NIOSH) as Safety and Health Compliance Officers, in insurance companies, and in manufacturing plants, especially those larger plants where noise and hazardous materials such as chemicals and asbestos are present.

The range of work environments for the industrial hygiene technician is broad and includes:

- Chemical manufacturing plants
- Machine shops
- Sheet metal shops
- Steel mills
- Foundries
- Printing plants
- Paper mills

In small plants the technician may not be employed as such full time and may perform other tasks such as typing, filing, or production work.

There are number of professional associations concerned with occupational health and safety. A partial listing includes:

- The American Industrial Hygiene Association
- The American Academy of Industrial Hygiene
- The Industrial Medical Association
- The American Board of Industrial Hygiene
- The American Society of Safety Engineers

### Student Considerations

Industrial hygiene technicians must have normal sight, hearing, taste, smell and manual dexterity. Some settings may require physical

agility, such as climbing to the top of an exhaust stack to sample air pollutants. Technicians must be able to use measuring and monitoring equipment such as sound level meters and gas leak detectors. In every setting, the ability to collect and record data accurately and write concise, comprehensive reports is important.

Public sector job opportunities require the ability to work well in on-site situations and may require extensive travel. Some private sector jobs may require the technician to travel between a number of sites in the same company.

In the private sector, the technician should develop the skills to work effectively with many divisions within the corporate structure, including personnel and engineering departments. Experience in working within a broad range of work environments and in cooperation with departments such as personnel and engineering will do much to enhance interoccupational mobility for the industrial hygiene technician. With sufficient experience and/or additional course work in business management or engineering, the technician could qualify for managerial level positions in industrial relations and safety engineering, for example.

Conversely, those already working in the areas of personnel and engineering could well transfer to the area of industrial hygiene after additional education.

The occupational structure and certification procedures within industrial hygiene lend themselves particularly well to advancement within the profession. For example, four grades of personnel above the level of technician have been identified:

- Industrial Hygiene Trainee
- Assistant Industrial Hygienist
- Associate Industrial Hygienist
- Industrial Hygienist

Progression from the level of technician through these grades depends on additional academic training and/or experience.

Graduates of two-year postsecondary school programs in industrial hygiene technology can expect entry-level pay in the range of $8,000-$9,000 per year. As the technician gains experience, the salary should increase to range between $15,000 and $20,000. Completion of a baccalaureate entry-level program in industrial hygiene and/or safety would provide entry-level salary in the range of $13,000 to $18,000, if the student is also certified. Managerial responsibilities in industrial hygiene provide opportunity for increased salary levels, and a certified industrial hygienist with at least a bachelor's degree and experience in the field can earn $20,000 to $25,000.

Students should be made aware of certification requirements and of the range of specializations within the field.

Some areas of specialization are:

- Chemical hazards
- Air pollution
- Noise pollution
- Water pollution
- Physical stresses
- Laboratory procedures.

Certification is currently available only at the level of Certified Industrial Hygienist by the American Board of Industrial Hygiene. However, consideration is being given to certification for other levels of personnel such as industrial hygiene technicians.

The industrial hygiene technician is not in a dead end job. In addition to the above considerations, academic programs in industrial hygiene exist on all levels from the baccalaureate through the doctorate, and it is possible for the technician to develop his professional competence by enrollment in these programs.

**Curriculum Guidelines**

Few, if any, two-year education and training programs exist for industrial hygiene technicians. There are academic programs from the baccalaureate through the doctorate levels. Short programs of eight to twelve hours of classroom time have been developed for in-service preparation for workers and management at the foreman level. There is an increasing need for technician level programs.

Existing baccalaureate programs can provide valuable guidelines for development of two year associate degree technician programs. Educational institutions offering baccalaureate programs would have ready access to both the specialized equipment and faculty required for the educational preparation of technicians.

Curriculum for the industrial hygiene technician should include technical and nontechnical components and a practicum. There is little new material needed for this curriculum. Courses can be selected from existing baccalaureate programs that will give the student the technical knowledge needed for the performance of the job. Most of these courses give the student a basic introduction to industrial hygiene. More detailed course work, in chemistry and physiology for example, would be reserved for baccalaureate and graduate level programs. Example of course content follow:

| NON-TECHNICAL COMPONENTS |
|---|
| Objective: The student will demonstrate skills in human relations appropriate to the industrial hygiene technician.<br><br>Topics:<br>Interpersonal dynamics<br>Management and leadership skills<br>Observational learning |
| Objective: The student will demonstrate an understanding of the history, legal and moral implications and current legislation concerning industrial hygiene.<br><br>Topics:<br>Health and Safety Legislation<br>Institutional structures (government and corporate)<br>Development of U. S. safety and health regulations<br>The Occupational Safety and Health Act<br>Structure of the Office of Safety and Health Administration<br>Structure of the National Institute of Safety and Health<br>Current government enforcement practices<br>Moral and ethical considerations of safety and health regulations |

| TECHNICAL COMPONENTS |
|---|
| Objective: The student will demonstrate knowledge of industrial hygiene, its specialized language, and related disciplines. |
| Topics: Survey of Industrial Hygiene<br>General introduction to engineering, manufacturing and scientific disciplines |
| Objective: The student will demonstrate understanding of how human physiology is affected by chemical substances and mechanical devices. |
| Topics: Chemistry<br>Physics<br>Mathematics to the level of calculus<br>Physiology |
| Objective: The student will demonstrate expertise in laboratory methods, use of measuring devices, and the collection and recording of data. |
| Topics: Standard Laboratory procedures<br>Data collection and recording<br>Record writing<br>Use and calibration of measuring devices such as gas leak detectors and noise level meters. |

### Work Experience

The Industrial Hygiene Technician is frequently involved in identifying potential hazards to long term health and the loss of life and limb. Expertise can be developed only by a combination of classroom and real world experience. Practice in a working environment, under the tutelage of qualified personnel is strongly recommended.

### Information for Program Planning

In those cases where it is feasible a technical level education program can be most expeditiously implemented within an existing baccalaureate program for Industrial Hygienists, since equipment and faculty is readily available.

In those cases where this procedure is not feasible, implementation of a technician level program would require an investment of $10-20,000 in equipment, and this equipment, because of technological changes now occurring in the field, may rapidly become obsolete. It is strongly suggested that the development of any technician-level program integrate the resources of educational institutions, appropriate professional associations, and private industry. If the program is conducted on a cooperative basis with the active participation of industry and employers already involved in an industrial hygiene function, many problems related to equipment availability could be solved.

Many of the elements of a technician-level industrial hygiene program would be of interest and value to students in related disciplines. An overview of industrial hygiene would be valuable to any engineering student, for example. In addition, refresher courses could be offered to practicing technicians, and those in related areas.

Acquainting prospective employers with the potential of the technician's function is an important consideration in implementing such a program. Program implementation depends primarily on the cooperation of industry, education and professionals.

### Conclusions

Compliance with new government health and safety regulations require employers to introduce preventive measures, and it is at this point that the trained technician can be usefully employed. As the government increases its enforcement of health and safety regulations, and as more employers evidence voluntary compliance with these regulations, the demand for trained industrial hygiene technicians will increase markedly.

## NUCLEAR QUALITY ASSURANCE INSPECTOR

*Technical*

### Job Description

The nuclear quality assurance inspector works at any component manufacturing company, construction site, or power plant involved in the ultimate or actual operation of any kind of nuclear facility to insure that product or system malfunctions do not occur. In view of the potential hazards to the health and safety of the public the inspector performs quality control tasks promulgated in Federal regulations for all phases of a nuclear power plant, including design, fabrication, construction and operation.

### Summary Assessment

The nuclear power industry has grown rapidly in a short time and all available indications point to an even greater rate of growth in the next decade. Twenty-two years ago the first nuclear power plant was put into operation, today there are over fifty nuclear power plants, and there are currently another 172 plants under construction, on order, or with letters of intent. In 1973, the Atomic Energy Commission estimated that two-thirds of the utilities which expected to have nuclear power plants in operation by 1982 had no actual operating experience with nuclear power plants. They estimated further that for the period 1973-1982 an additional 15,500 nuclear-oriented utility plant and headquarters staff of all types, not including replacements, will be needed.[1]

Codes and standards for nuclear quality assurance functions, from the planning of a power plant to its operational stage, have been or are being developed by several organizations, whose members come from industry, professional societies, and government agencies. Ultimately, upon incorporation of National standards and regulatory guides into safety analysis report commitments, these standards gain the force of law. The American National Standards Institute estimates that approximately 5,000 codes and standards are required to support the design, construction and operation of a nuclear power station. Personnel qualifications and performance standards are becoming subject to strict control.

There are now approximately 16,500 nuclear quality assurance inspectors in the industry. According to Utility Staffing and Training for Nuclear Power,[2] the number of nuclear plants will more than double between 1974 and 1980. On the basis of these figures, a demand for inspectors on the order of approximately 15,000 over the next five to ten years is reasonable.

Technological changes in the nuclear industry tend to occur at a rapid rate. Sources have therefore stressed the need for training programs to be sensitive to these changes.

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[1] Utility Staffing and Training for Nuclear Power, June 1973, AEC, Washington (#1130 Revised).

[2] Ibid.

In the United States, an industrialized Nation with high power requirements, continued dependence on traditional energy sources has come to be seen as inadequate for the country's needs. Every 10 years, the United States' demand for power doubles. The nuclear industry is currently the best practical alternative to fossil fuel sources available to us over the next two or three decades.

**Employers and Occupational Setting**

The following list illustrates the diversity of employers for this occupation. Major sources of employment are:

- Architect engineering contractor firms which design the buildings to house the reactors
- Reactor manufacturing companies (nuclear steam system suppliers)
- Prime contractors and subcontractors which provide components for the construction project
- Utility companies which operate the power stations.

Secondary sources of employment include:

- Laboratories which have a nuclear capability
- Health care technology firms engaged in radiation-related methods of medical or surgical treatment.

Given the wide range of employers, there are no longer any geographical restrictions for this job. In terms of numbers, there are many more openings for nuclear quality assurance inspectors away from the power plant site than there are on-site. It should be noted that primarily at the subcontractor level, nuclear quality assurance inspectors are often given a different job title, but their functions remain the same.

After his or her training period, the inspector's employment will be affected by the decisions and regulations of the Nuclear Regulatory Commission, which in turn receives substantial advice from the professional organizations, such as

- American Society of Mechanical Engineers
- American Society for Quality Control
- American Nuclear Society.
- American Concrete Institute

- Institute of Electronic and Electrical Engineers
- American National Standards Institute
- Atomic Industrial Forum
- American Society for Non-destructive Testing, Inc.

**Student Considerations**

The nuclear quality assurance inspector must be physically fit: persons who are confined to wheelchairs or are blind will not be able to perform the required work. Deaf persons could be inspectors in jobs requiring only visual inspection. In some cases the necessity for a security clearance excludes people with criminal records. In other cases, the acceptability of a person with a criminal record will depend on the individual company's policy. Sources all agreed that the only prerequisites for postsecondary training are a high school diploma (or the equivalent) and proof of good health.

Certification procedures are contained in the Nuclear Regulatory Commission Regulatory Guide 158, which in turn endorses the American National Standards Institute's Standard N45.2.6. Certification is awarded by the company's Quality Assurance Department, in accord with these standards.

Inspectors are generally unionized employees; the unions vary with the companies and the location of the job. One source says there are perhaps more than a hundred unions active in this area; another says that the most important union for the job is the International Association of Machinists. All sources agreed that there are generally no membership restrictions in these unions, although construction-related unions have traditionally been more restrictive than others.

Depending on the employer, inspectors may work at construction sites, at manufacturing shops (inspection of vendor components), at the utility site after the reactor is in operation (operations inspection), or at company headquarters. The work will therefore range from a team effort to a solitary effort, and from the safe conditions of office work to possible hazards of construction, manufacturing and radiation. In addition, vendor sites vary in conditions, including exposure to heat and cold, toxic materials, etc.

Several personal qualities are essential to the good inspector. Given the critical importance of the work and the danger that could result from errors, it is crucial that the inspector be meticulous, thorough and methodical. An inspector must be assertive and self-confident, be able to maintain his evaluations in the face of opposition from workers, and not allow his judgments to be influenced by friendship with workers whose work he is inspecting. Beyond this, the inspector must possess an unusual degree of integrity, honesty and incorruptability; for example, efforts on the part of some subcontractors to influence an inspector's evaluation with monetary rewards, although rare, are not totally unknown in the industry.

Inspector salaries range from about $8,000 - $12,000 per year for an entry-level position to $15,000 - $20,000 for a highly experienced inspector with no further formal academic training. Salaries do have some fluctuation patterns. Geographically, they are lower in the South than in the North, where union contracts reflect variations in the cost of living. Industry-wide, salaries tend to be highest at architect engineering firms, medium at reactor manufacturing companies, and lowest at utilities and subcontracting companies.

Placement sources for finding jobs are recruitment officers who come to schools, newspaper advertisements, state employment agencies, and in large cities, private employment agencies specializing in quality assurance jobs.

Entry-level nuclear quality assurance inspectors would be qualified for the following positions:

- Quality data reviewer
- Quality assurance inspector

Variations on these job titles are found particularly in firms which supply component parts for nuclear reactors.

An inspector with work experience but no further formal preparation can expect to move up to supervisory positions, either technical or administrative, in the various inspection disciplines (i.e., mechanical, structural, concrete, etc.). Such positions are located at the construction site, at company headquarters, or at supplier factories in the field, and include:

- Lead man in each inspection discipline
- District chief, procurement area
- Assistant field quality assurance superintendent
- Senior field quality assurance superintendent.

With additional courses or work in management while employed as an inspector, a person could move up to middle management positions. Upper management and engineering positions are possible upon completion of an engineering degree.

Skills learned as a nuclear quality assurance inspector are transferable to a wide range of employment opportunities: all technical manufacturing companies use some quality assurance/control procedures. Other possible fields for employment are:

- Construction
- Electronics

- Process Control
- Automotive industry
- Aircraft industry
- Consumer appliance industry.

Mobility is affected by the inspector's discipline, e.g., a civil/structural inspector would have more difficulty in being hired by an electronics firm than an electrical inspector.

### Curriculum Guidelines

Industry representatives agree on the acute shortage of trained inspectors and that existing education training options are inadequate. Currently, there are short-term upgrading programs for persons already employed in the nuclear industry, and while 150 schools in the country offer degrees or courses in quality control, none of them has concurrent nuclear quality assurance training.

Sources, in general, felt that a two-year program for inspectors is adequate, although a minority felt that one year was possible. A two-year program will lead to an associate degree and/or a professional certificate. Some components of the program are to be found in ordinary postsecondary curricula, such as English and statistics; others will be new components coming from the expertise of industry, such as courses in various areas of nondestructive testing.

A successful program in Oak Ridge, Tenn., the Training and Technology Program (TAT), in nondestructive testing procedures for nuclear welding could be consulted for that part of the curriculum. The program planners' main area of innovation will concern the practical, as opposed to the theoretical and background material to be taught.

Other than the usual teaching aids, the requisite equipment will be specific to each area of inspection. As it is desirable for students to be familiar with the most recent technological developments, a program that includes time spent at local companies supplying the nuclear industry, perhaps on a cooperative basis or as a series of on-site classes, could be worked out. In the event that a cooperative arrangement with local employers proves impossible, contributions or partial subsidy from employers for equivalent school equipment are not out of the question. In any case, hands-on experience, using either company or school-owned inspection facilities, is essential.

It should be possible to construct a program for nuclear quality assurance inspectors that provides a core group of courses generally applicable to all inspection disciplines, and then separates the students into specific discipline areas. A course in the codes and standards applied to each discipline would be necessary after the core courses.

| CORE COURSES FOR ALL INSPECTORS: COMPONENTS NOW OFFERED IN VOCATIONAL/TECHNICAL INSTITUTIONS | |
|---|---|
| Objective: The student will demonstrate broad understanding of the field of quality control, the nuclear industry, and the nature of federal authority in the industry. | |
| Topics: | Quality Control: its history, philosophy and procedures<br>Overview of the nuclear industry, including basic power plant design, radiation physics, radiation detection<br>Introduction to federal regulations affecting the nuclear industry, including unit on ethics. |
| Objective: The student will demonstrate detailed knowledge of quality control conceptual tools, including mathematics. | |
| Topics: | Basic engineering, including blueprints and drawings<br>Mathematics, including algebra, geometry, trigonometry, statistics |
| Objective: The student will demonstrate an understanding of the physical characteristics of inspectable materials. | |
| Topics: | Introduction of manufacturing procedures<br>Brief review of relevant principles of physics, chemistry and properties of materials |
| Objective: The student will write clearly and concisely. | |
| Topics: | English, including technical exposition |

Following the core courses, inspectors in the six major inspection categories will take courses tailored to the requirements of specific disciplines.

| NEW COMPONENTS |
|---|
| Objective: The student will demonstrate the ability to apply the quality assurance codes, standards, and testing procedures for each inspection discipline. |
| Topics: Geotechnical, including soils<br>Concrete<br>Structural<br>Mechanical<br>Electrical<br>Instrumentation<br><br>Each area will include courses in:<br><br>All codes and standards applicable to nuclear quality assurance activities<br>Nondestructive examination procedures<br>Specific education in the principles of the discipline. |

**Information for Program Planning**

Program planners can respond with confidence to the undisputed need for training options in nuclear quality assurance. Close cooperation with the industry can be achieved on a continuing basis.

If a cooperative arrangement can be worked out with one or several local nuclear-related companies, necessary equipment can be limited to teaching aids, such as videotape machines, movie projectors, etc., which might cost $7,000 to $12,000 new, but which are usually available at vocational/technical institutions. Books and training films are readily available from nuclear equipment manufacturers.[1] For schools finding it impossible to use the resources of a local nuclear company, it is estimated that the cost for this equipment would amount to approximately $20,000 per discipline. Prospective employer contributions might be possible.

Existing postsecondary teachers could be utilized for the core courses. For the discipline-related materials all sources agree that the best instructors would be those with practical experience, preferably in the nuclear industry. Current nuclear quality assurance inspectors

[1] E.g., Starrett Gauge and Control Corporation, a firm that manufactures tool and gauge supplies, has educational films; other such companies are Automation Industries, Brown and Sharpe, Federal, and Do-All.

with a minimum of five years of experience in the appropriate discipline would be the most desirable. It is also suggested that the professional societies, such as the American Nuclear Society, the American Society for Quality Control, the American Society of Mechanical Engineers, the American Society for Nondestructive Testing, Inc., or the Institute of Electronic and Electrical Engineers, might be a source of instructors.

## Conclusion

The nuclear industry is without doubt a growing one. The shortage of qualified inspectors is acute, and interoccupational mobility for nuclear quality assurance inspectors is not difficult. Educational programs for nuclear quality assurance inspectors promise to solve a serious manpower shortage in an area perceived as a National need.

## PHYSICAL SECURITY TECHNICIAN

*Technical*

### Job Description

Physical Security Technicians apply the theories and techniques of security and loss prevention to the design, installation, maintenance and monitoring of sophisticated industrial monitoring systems and fire and burglar alarm devices and systems. They may provide technical assistance to builders and/or architects integrating protective systems into new buildings, or they may analyze the requirements for and install protective systems for existing structures.

### Summary Assessment

There are two major factors in assessing demand for physical security technicians:

- Increasing sophistication and automation of many industrial, commercial and domestic operations has created demand for reliable devices to monitor a wide range of functions such as automatic heating systems, machinery stoppage, temperature deviations, loss of air pressure or vacuum, and liquid or material levels.

- The current 15% to 25% annual growth in the national crime rate has increased concern for security in public, private and domestic areas.

These two factors have done much to make security a growth industry. Security sources estimate that:

- From 500,000 to 2.5 million people are currently employed by public and private security agencies.

- The ratio of security personnel to public law enforcement officers is 1.5:1.

- National expenditures for private security services far exceed expenditures in the public sector.[1] (One security company reported $165 million gross revenues for 1974.)

It is estimated that there is a current need for one technician for every fifty security personnel, or, conservatively, 10,000 physical security technicians. Another estimate placed the current demand for technicians at 20,000 with a projected ten-year growth rate of 30% to 50%.[2]

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[1] Academic Guidelines for Security and Loss Prevention Programs in Community and Junior Colleges (American Society for Industrial Security, 1972), pp. 8, 14; and personal conversation with Dean Timothy I. Moran, Northeastern University.

[2] Personal conversation with Milt Pollen, U.S.A.F. (retired), Chief Investigator D.O.D.

In addition to the above growth factors, the increasing sophistication of the security industry has created a demand for technicians knowledgeable about solid state electronics, optical scanning devices, and many other new technical areas.

### Employers and Occupational Settings

Physical security technicians are frequently employed by contractual security companies and manufacturers of security devices. During the installation of security devices, the technician working for contractual security companies and manufacturers of security devices would be involved in a variety of field settings, including manufacturing plants, banks, hospitals, restaurants, utilities, retail stores, museums and construction firms.

The field settings serviced by contractual security companies and manufacturers of security devices suggest additional occupational settings for physical security technicians. Manufacturing plants, for example, presently employ large numbers of security personnel, including technicians and security managers.

The American Society for Industrial Security (ASIS) is concerned with the development of curriculum guidelines in this area, and in cooperation with the Private Security Task Force to the National Advisory Committee on Criminal Justice Standards and Goals, is investigating standards and goals for the security industry. According to a recent survey, 87% of the security industry expressed positive interest in industry-developed standards, including certification programs.

### Student Considerations

Physical security technicians must have normal sight, hearing and manual dexterity. Some functions such as installing monitoring equipment at construction sites, may require physical agility and mechanical ability. Technicians must be familiar with a wide variety of sophisticated equipment such as videotaping equipment, and be able to choose the most effective equipment for a particular installation from many available devices.

Job opportunities with contractual security companies and security equipment manufacturers may require the ability to work well in on-site situations and may require extensive local travel. In residential installations, a knowledge of individual family living patterns is indispensable.

Although ex-offenders in some cases may not be eligible for jobs in this field, in other instances the "inside view" of rehabilited ex-offenders may be particularly welcome. It is very probable that the guidelines being developed by ASIS and the Private Security Task Force will address this area.

The student should be made aware of the wide variety of settings in which security equipment is used, and the variety of the equipment itself, as well as the possibilities of specialization, such as:

- Electronic fire and theft protection
- Videotaping equipment
- Retail sales security
- Inventory control
- Production monitoring equipment
- Residential protection equipment

Graduates of two-year postsecondary programs with no experience can expect entry-level pay in security-related firms of $7,000 to $8,000 per year. Students who enroll in an associate degree program, while working for a firm in the security industry, will command higher salaries. Given such a work-study combiration, which might involve four years of part-time study and full-time work, a salary of $9,000 to $11,000 per year would be realistic. With additional course work and managerial experience, mid-level management positions with salaries of $20,000 to $25,000 per year are possible.

The security industry also has a strong need for technical sales representatives. Much selling of security equipment is now done by part-time untrained persons with little technical knowledge of the security field. Sales representatives need a strong background in security technology as well as sales ability.

The technician should have a good general knowledge of security needs and practices in different settings. This knowledge will be valuable for interoccupational mobility. For example, a technician with experience in field installation of security equipment in retail stores and with additional educational preparation in management, could become a mid-level manager of retail security for a large department store chain, with a salary of $20,000 to $25,000. Similar opportunities exist in the transportation industry (airlines, bus, rail, shipping and trucking firms), in museums, hotels and many other settings.

### Curriculum Guidelines

Few programs exist in the general area of security and loss prevention. In 1972, ASIS reported only two associate level programs, five certificate programs, and a smattering of short (4-10 hour) programs. Additional programs are in the planning stage. With the exception of proprietary in-house programs at some larger companies, educational preparation for physical security technicians is not available.

However, some educational institutions do offer law enforcement programs. Courses from these programs such as criminology and introduction

to civil and criminal law, combined with courses from other areas such as chemistry and sociology could provide the broad interdisciplinary foundation required. In those institutions where law enforcement and science programs coexist, the only new courses for a curriculum in physical security technology would be courses in security theory and techniques, and introduction to security and loss prevention devices.

Courses should cover three broad areas, technical, and non-technical components plus practical experience, as summarized below.

| COMPONENTS |
|---|
| Objective: The student will demonstrate an understanding of the design and operation of security devices. |
| Topics: Technical mathematics<br>Chemistry<br>Physics<br>Basic electricity |
| Objective: The student will apply security theory and techniques to specific devices and their installation. |
| Topics: Fire prevention<br>Theft prevention<br>Loss prevention<br>Introduction to security and loss prevention devices |
| Objective: The student will demonstrate an understanding of the legal and human context of security systems. |
| Topics: Introduction to criminal and civil law<br>Sociology<br>Criminology |

**Work Experience**

The physical security technician must develop a broad base of technical knowledge and ability through hands-on experience. For this there is no substitute for actual work experience. It is therefore suggested that the student acquire this experience either through a strong cooperative program involving industry and the educational institution, or through a tuition refund program sponsored by industry.

## Information for Program Planning

A physical security technology program can be established most easily in those institutions currently offering both law enforcement and science programs. The additional security theory and technique courses could be taught by experienced personnel from the security industry.

The wide variety of specialized security equipment now available and the speed of technological development in the area suggest that it would not be economically feasible for educational institutions to completely equip a security lab.

It is strongly recommended that the development of a physical security technology program involve educational institutions, professional societies, private industry and employers. This integration of resources, particularly with the cooperation of local security companies or manufacturers of security equipment, would solve equipment availability problems and provide a source of instructional staff for security theory and techniques courses. Practically, this integration would best be attained by either a tuition refund program financed by employers or a strong cooperative program.[1]

## Conclusion

In summary, the increasing sophistication of security devices and the annual growth in the national crime rate have combined to create a high level of demand for security personnel at all levels. The physical security technician can expect a strong market for his expertise, a wide variety of occupational settings, excellent job mobility, and a well-structured career ladder with job responsibilities ranging from technician through at least mid-level management and salaries from $8,000 at entry level up to $25,000 for management.

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[1] University College at Northeastern University has one of the two associate degree programs in law enforcement and security in the country.

## PODIATRIC ASSISTANT

*Technical*

### Job Description

The Podiatric Assistant performs various services, under the supervision of a podiatrist, ranging from diagnostic charting to assisting in surgical procedures. Podiatric assistants take and process X-rays, compose and autoclave surgical packs, construct orthotic and prosthetic foot devices, and administer physical therapy. They assist the podiatrist in surgery and in therapeutic procedures. They may also deliver podiatric health education to patients and take care of office management, including the supervision of the appointment schedule, maintenance of patient records and coordination of office activities.

### Summary Assessment

The number of practicing podiatrists has steadily increased in the last several decades from approximately 6,400 in 1950 and 7,100 in 1960 to 8,000 podiatrists now licensed in the United States.[1] The projected growth rate of the number of persons practicing podiatry between 1972 and 1985 is 15%.

Factors that support the 15% projected growth rate in the number of practicing podiatrists include:

- The historical increase of at least 10% every decade since 1950
- The fact that 75% to 85% of the adult population in the United States is foot defective[2]
- The inclusion of podiatry benefits in health insurance plans (e.g., Blue Cross and Blue Shield of Massachusetts).

Many podiatrists presently employ at least one assistant. There are 6,000 to 7,000 podiatric assistants in the United States, according to Zelda Vicha, Executive Director of the American Association of Podiatric Assistants. Since some podiatrists currently employ, or would like to employ, more than one assistant, it is estimated that 2,000 openings exist at the present time throughout the country; and as the number of podiatrists and the demand for their services increase, the demand for podiatric assistants will also increase.

The people who are now employed as assistants to podiatrists are typically high school graduates with little or no postsecondary school

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[1] Health Resources Statistics, 1974 (National Center for Health Statistics).

[2] Occupational Manpower and Training Needs (Bureau of Labor Statistics, 1974).

education. Many of these assistants provide secretarial services only, but some have been trained by their employers to take medical histories, provide physical therapy, and deliver health education advice. With the projected increase in patient load of podiatrists, it is expected that podiatric assistants will, in turn, be required to provide more technical and professional services to patients. In order to provide these services, they will need to have more scientific knowledge and skill preparation. It is this significant change in function that identifies this occupation as a new and emerging one.

### Employers and Occupational Setting

Most podiatric assistants work in a podiatric office setting with either a single podiatrist or a team of podiatrists. There is presently little demand for podiatric assistants from other employers such as Federal, State or local governments, osteopathic hospitals, or training institutions, although this may be expected to change as more institutions begin to offer programs for training podiatric assistants.

Since podiatrists tend to practice in cities in the more heavily populated states, the demand for podiatric assistants tends to be higher in these regions, i.e., the northeastern States, Illinois and California.[1] However, there is an increasing demand for trained podiatric assistants from podiatrists all over the country.

The three institutions currently offering courses for podiatric assistants, in Kentucky, Pennsylvania and Maryland, are sources of employees for podiatrists seeking assistants. However, most podiatric assistants are still found through local advertising by podiatrists.

### Student Considerations

There are no unusual physical requirements for this occupation, although podiatric assistants should have an aptitude for biomechanics and should exhibit manual dexterity in order to be able to fabricate prosthetic and orthotic devices. People whose handicaps do not relate to the requirements cited above are employable. At the present time, the occupation is attracting more women than men, but there are no sex restrictions regarding employment.

A license or certificate specifically for podiatric assistant is not required in any State at the present time, although some States require a certificate for persons who operate radiography equipment. Certification for the practice of this occupation may be acquired through examination from the American Society of Podiatric Assistants. This certification does not rely on educational or training level attained but on success in an examination administered by three podiatrists and three podiatric assistants.

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[1] Health Resources Statistics, 1974, op. cit.

As in most allied health settings, podiatric assistants must be able to get along well with people. They must work closely with a podiatrist and other members of the podiatric team, and be able to communicate clearly, and to relate well to patients.

There are no unusual safety or health hazards for the podiatric assistant except the danger caused by exposure to X-rays, from which an operator can be protected.

There are now three programs for training podiatric assistants: Jefferson Community College in Kentucky, Pennsylvania College of Podiatric Medicine, and Essex Community College in Maryland. A program at the California College of Podiatric Medicine for training assistants is presently in the planning stage.

The prerequisites vary in each of the institutions currently offering educational preparation for podiatric assistants. For example, the courses in Maryland have none, but these are courses designed primarily for persons already employed as podiatric assistants and therefore presume a certain amount of practical experience in the field. The Kentucky program does not require any particular academic background. At the Pennsylvania College of Podiatric Medicine, secondary school work in mathematics, chemistry and other sciences is strongly recommended.

Data regarding wage scales is difficult to obtain. Salaries vary widely from office to office and by geographic location. Salaries are also dependent on the amount of formal podiatric training the beginning employee has. Students graduating from the two-year program in Kentucky now receive starting salaries of $140 per week, but this figure is considered to be unusually low by the American Society of Podiatric Assistants. Increases in salary are fairly routine, commensurate with increased ability and education and with the acquisition of a certificate.

The skills and knowledge acquired by podiatric assistants are transferable to other occupations, particularly in the health field. Their therapy, radiography, patient history-taking, surgical assistance, health education, and office management abilities can all be applied to other settings such as hospitals or other physicians' offices. Podiatric assistants also enroll in podiatry colleges to earn the Doctors of Podiatric Medicine degree, or enter registered nurse's training.

### Curriculum Guidelines

The occupation of podiatric assistant is important to educational planners not only because there is a demand for more assistants, currently estimated at 2,000, but because there is a demand for formally trained assistants.

The majority of podiatric assistants presently employed have learned their skills on the job. In the typical case, a podiatrist will advertise for an assistant, and then train a person to meet the needs of the practice. None of the three programs offering courses in podiatric assistance has been in existence more than four years, and there are probably not more

than 50 students currently enrolled in these programs. At the same time, demand for trained podiatric assistants is great: existing programs have no difficulty in placing their graduates throughout the country.

The three formal curricula now in existence offer several kinds of programs. The program at the Pennsylvania College of Podiatric Medicine grants a certificate at the end of a one-year course. Jefferson Community College offers an associate degree at the end of two years. Essex Community College in Baltimore County, Maryland, offers both one-year and two-year programs, granting a certificate and an associate degree respectively. As was noted earlier, both Essex programs are geared for people who are already employed as podiatric assistants.

Although it is largely from podiatric assistants themselves that the demand for formal, two-year programs has come, there is also a rising interest among podiatrists in the implementation of two-year programs for all future podiatric assistants. Two-year programs are recommended because they are better able to provide knowledge which forms the basis for technical preparation. A two-year program can prepare a podiatric assistant to perform all of the services which a podiatrist might require, including radiography, pathophysiology, surgical assistance, biomechanics, chemistry, microbiology and physical therapy. A one-year program can give podiatric assistants only a superficial background in the basic sciences and an introduction to the basic skills needed and therefore limits their services to podiatrists.

It would appear, therefore, that a two-year program leading to an associate degree would meet the needs of the podiatric profession for more skilled and knowledgable assistants. This implies that existing programs leading to the associate degree would probably not be affected. Programs which offer only a certificate may have to expand their material resources; but programs offered in colleges of podiatric medicine, such as the Pennsylvania College of Podiatric Medicine, have the necessary equipment, and training personnel or instructors. Where podiatric assistant programs are established in conjunction with colleges of podiatric medicine, existing staff may be utilized.

Since there are presently only five colleges of podiatric medicine in the United States, in California, Illinois, New York, Ohio and Pennsylvania, and since there is an increasing demand for podiatric assistants throughout the country, educational planners may contemplate establishing more programs for podiatric assistants within the community college setting. In these cases, it should be noted that the instructional elements required in preparing podiatric assistants are similar to those required for other allied health professions, e.g. radiography, pathophysiology, chemistry, surgical assistance, etc. The new elements that would have to be provided would include biomechanics, the construction of orthotics, and the podiatric focus.

The two-year curriculum should include the following components, schematically represented.

| TECHNICAL COMPONENTS |
|---|
| Objective: The student will demonstrate an understanding of human anatomy, of the anotomy of the foot, and of podiatric pathophysiology. |
| Topics: Anatomy<br>Physiology<br>Anatomy of the foot<br>Diseases of the foot<br>Treatment of foot disease |
| Objective: The student will be able to design and construct orthotic and prosthetic devices. |
| Topics: Theory of biomechanics<br>Materials used in constructing devices<br>Techniques of biomechanics |
| Objective: The student will demonstrate the ability to take and process X-Rays. |
| Topics: Radiography<br>Safety precautions in the use of X-rays<br>Techniques of radiography |
| Objective: The student will demonstrate the ability to administer physical therapy treatments. |
| Topics: Theory of physical therapy<br>Equipment used in physical therapy<br>Techniques of physical therapy |
| Objective: The student will demonstrate the ability to assist in surgery. |
| Topics: Podiatric Surgery<br>Techniques of surgical assisting,e.g.,<br>composing and autoclaving surgical packs |

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| NON-TECHNICAL COMPONENTS | |
|---|---|
| Objective: The student will demonstrate communication and human relation skills required in the patient/assistant relationship. | |
| Topics: | Communications skills -- Expository writing<br>Podiatric health education -- Methods of teaching patients and families regarding podiatric health.<br>Podiatric history and physical examination -- Diagnostic charting; interview techniques<br>Psychology |
| Objective: The student will demonstrate office support skills. | |
| Topics: | Typing<br>Maintenance of patient records<br>Maintenance of business records |

As in other allied health educational programs, a combination of classroom, laboratory, and clinical experience is required for adequate preparation. Clinical experience should take place in practicing podiatrists' officers, or, if other employers, such as hospitals, begin to use podiatric assistants, in those locations.

### Information for Program Planning

Few of the podiatric assistants currently employed have received any training beyond that provided by the podiatrists for whom they work. Increased availability of formal education and training programs, leading at the least to a certificate and optimally to an associate degree, would be welcome by many podiatric assistants because there is a strong desire to upgrade skills learned on the job. As the demand for podiatric services increases, it seems likely that podiatrists will delegate a number of functions to trained assistants.

At the same time, program planners should be aware that some podiatrists may resist the idea of making more two-year programs available both because they do not wish to delegate certain procedures to their assistants and because they do not wish to pay the higher salaries that trained assistants will demand. Nevertheless, podiatrists can probably be persuaded that the extensive use of trained assistants benefits their

own practice, in that they will thus be able to provide their patients with more intensive care and to treat more patients.

Podiatrists, as potential employers, should be involved in curriculum development and should be used as instructors for those portions of the program that require extensive podiatric knowledge. Podiatrists can have an additional impact during the clinical phases of preparation by providing opportunities for students to work in their offices.

It should be noted again that many of the curriculum components cited earlier are similar to those that would be used in preparing students for other allied health professions and therefore totally new programs for podiatric assistants are not contemplated.

### Conclusion

Since there is no need to design entirely new curriculum, it is clear that the major concern of State vocational education directors and curriculum planners must be to determine the extent of demand for podiatric assistants in their localities. The identification of local or regional demand should lead to the development and implementation of preparatory programs for podiatric assistants in association with other allied health education efforts.

## CRYSTAL MANUFACTURING

*Technical/Skilled*

### Job Descriptions

Crystal technicians direct, oversee and monitor the complete crystal production process, including growing, polishing, fabricating and assembling. They must be able to perform all the operations associated with these processes, and, in addition, to "trouble shoot" and make any necessary adjustments to the process to assure quality products. They frequently perform first line management functions, e.g., foreman.

Crystal growers are skilled workers who prepare semi-conductor raw materials, such as silicon and germanium, for processing. They operate a great number of different manual and automated machines involved in the growing of crystals, since each kind of crystal requires specialized equipment.

Crystal polishers are skilled workers who operate the machines that transform rough crystals into a highly polished sheet suitable for use in a variety of semiconductor devices. They use micrometers and other precision measuring devices, polishing and slicing equipment and optical devices.

Crystal fabricators are skilled workers who perform functions similar to crystal polishers. Depending on the industry and job setting, the polisher converts crystals into sheet form, and the fabricator performs the final cutting, shaping, and other necessary operations to transform the crystal sheet into individual items, such as solar cells. In many settings, polishing and fabricating are one job.

Crystal assemblers are skilled workers who work primarily in the solar energy industry connecting individual solar cells into larger assemblies called "arrays" (analogous to batteries). They use standard electronic equipment such as electrical measuring devices and soldering tools.

### Summary Assessment

The crystal industry, represented by the producers of semiconductors such as Monsanto, Union Carbide, Texas Instruments, and others, is at present highly competitive. Use of crystals in popular consumer products (e.g., calculators, digital watches, solid state radios and televisions, and optical devices) has forced up their demand. Consequently, manufacturers have been under pressure to increase production and lower the cost of crystals. This has led to research in the development of more cost effective crystal-growing processes than the small single batch processing which has been adequate until now. The impact of these developments on labor demand and skill requirements for crystal technicians has not been assessed consistently by industry representatives. On the one hand, increasing automation will certainly lower manpower demand, contributing to lower production costs. On the other hand,

programming increasingly sophisticated machines to produce crystals requires familiarity with crystal-growing processes and equipment and will require trained personnel.

Apart from consumer-oriented products, to which the preceding observations most immediately apply, crystals are used in solar energy conversion processes. This technology is still in the research and development stage, and a number of companies (e.g., General Electric, Honeywell, Motorola, RCA, Varian, Mobil-Tyco, Crystal Systems) are developing these technologies with private or government funding. Because solar energy operates without depleting natural resources or despoiling the environment, it could well become a serious competitor of other energy sources. One industry source has estimated that when the technology is fully developed, it will easily rival the automobile industry in size and job opportunities. Although these developments may be a decade away, the potential is real. In short, although consumer-oriented crystal production may have a more slowly developing long-term need for crystal technicians, the developing solar energy industry could well create unprecedented demand for skilled crystal technicians.

### Employers and Occupational Setting

Employment opportunities for crystal technicians exist primarily within private industry, especially within companies producing crystals for use in consumer-oriented products such as calculators and digital watches and/or crystal components for these products. At present, the setting for these jobs is a production-laboratory setting, although this may change with increasing automation of the process. In current solar energy research efforts, there is little demand for technicians as opposed to professional chemists and physicists. However, if the solar energy industry develops as suggested above, an increased demand for people trained in crystal manufacturing at all levels will result. This demand will grow as the technology becomes more sophisticated and the industry shifts from research to manufacturing.

Where certification is required by the employer, this certification would in most cases be handled by the Institute for the Certification of Engineering Technicians.

### Student Considerations

Crystal technicians should be able to work well in laboratory or semi-production environments, and should be comfortable with technical, sophisticated machinery. There are no sex restrictions, and rehabilitated ex-inmates can expect job opportunities based on individual company policies. People with physical handicaps which are not job-related would be acceptable, although some of the jobs involving manual dexterity or lifting crystals weighing some fifty pounds might impose some restrictions.

Many specific job opportunities exist within crystal manufacturing and students should be made aware of the variety of opportunities in the general field. Crystal growing and fabrication can be divided into a

number of overlapping, interdependent areas, with a specialization or expertise in each area implying a knowledge of all other areas. Crystals produced for the solar energy industry, for example, involve the refining or growing process, polishing, fabrication into solar cells and the assembling of cells into arrays, or batteries. Thus, in the solar industry, crystal technology will create jobs for crystal growers, crystal polishers, crystal fabricators, and crystal assemblers. Students should be encouraged to select an area of specialization that is consistent with current job demands and possibilities.

The career ladder in crystal manufacturing begins with skilled jobs --crystal grower, polisher, fabricator and assembler. Before advancing to technician, the student must be familiar with all these operations. The skilled worker, who, while gaining knowledge of these four areas on the job, also pursues a technical educational program, can advance, at the completion of the academic work, to technician.

Entry-level salaries for skilled workers are $7,500-$8,000, depending on experience. With experience as a skilled worker, and completion of a two-year technical program, the technician can expect a salary of up to $9,000. Additional experience and demonstrated expertise can lead to significantly higher salaries, ranging from $15,000 to $20,000.

Currently, the industry needs workers who are prepared broadly in the technology, which in turn enhances opportunities for interoccupational mobility and advancement. With sufficiently diverse experience and course work in a technical program, the skilled worker can become a technician. The technician with further experience and course work can qualify as a graduate engineer, or for related managerial positions, with salaries from $18,000 to $25,000. Technical writing and technical sales representation are also realistic opportunities within this salary range.

Depending on the products produced and the range of responsibilities of the individual technician, certification by the Institute for the Certification of Engineering Technicians might be desirable.

### Curriculum Guidelines

Although the greatest demand for crystal technicians is dependent on the future development of solar energy technology, some suggestions can be made on the basis of existing jobs. The anticipated growth of demand for crystal technicians makes curriculum recommendations difficult because of emerging technology. Both industry and educational institutions must stay abreast of the state of the art in the area, to devise concrete, meaningful curricula that reflect accurately assessed demands.

Overall, while there have been innovations in the field of crystal technology, it is not at all clear that these innovations have affected entry-level skill requirements, or that OJT, together with a general electronics or mechanical technician background, is not adequate for the skilled jobs of grower, polisher, fabricator and assembler. Some companies have set up their own education and training programs. Industry

sources have stressed the need for technicians with good general purpose backgrounds in either electronics technology or mechanical engineering technology at the associate degree level.

These considerations suggest that new curricula in the area of crystal technology can be easily developed along with emerging technology. That is, existing programs in electronic technology or mechanical engineering technology would need only the insertion of curriculum modules dealing specifically with crystal technology. With minimal changes in required course selection and sequencing, the addition of some new components, and restructuring of specifically pertinent courses, a program for skilled crystal workers and technicians could easily be devised.

Suggested topics are summarized as follows:

| ENGINEERING AND TECHNICAL COMPONENTS[1] (Existing Curriculum) |
|---|
| Objective: The student will demonstrate the necessary mathematical and technical knowledge to understand electronic circuits. |
| Topics: Technical mathematics<br>Physics for electronics<br>Circuit analysis -- AC and DC |
| Objective: The student will demonstrate an understanding of the engineering applications of basic electronic circuits. |
| Topics: Electronic devices<br>Electronic amplifiers<br>Introduction to digital electronics |
| Objective: The student will demonstrate expertise in laboratory methods and the use of measuring devices such as VOMs and oscilloscopes. |
| Topics; Instruments and measurements |
| Objective: The student will draw and write clearly |
| Topics: Drawing, sketching and diagramming<br>Technical report writing |

[1] c.f. Walter J. Brooking, ed., Career Opportunities-Engineering Technicians (Chicago: J. G. Ferguson, 1975), p. 174.

NEW COMPONENTS

Objective: The student will demonstrate knowledge of current theories and practices in crystal technology.

Topics:
- Crystal growth, both manual batch processing and automatic
- Miniature circuit theory and practice
- New applications of crystal technology, e.g., photovoltaic cells

PRACTICAL EXPERIENCE

Objective: The student will operate measuring and manufacturing devices in an industrial setting.

Topics:
- Experience with standard instrumentation devices
- Experience with standard manufacturing machines and equipment such as micrometers and optical measuring devices
- Actual production experience in manufacturing setting

## Information for Program Planning

Although existing courses might easily be revised to reflect current theories and techniques, technological change and increasing automation in the crystal growing process may make it difficult for educational programs to invest in the sophisticated and continually changing equipment for hands-on experience. Currently, industry compensates for the lack of available formal preparation and the lack of equipment in school laboratories by providing OJT for new technicians. However, if the demand for crystal technicians increases rapidly, as will be the case if solar energy becomes a major industry, there will be a need for more highly qualified technicians and formal education and training programs. This need can be met only if industry and educational institutions cooperate in curriculum planning and sharing of equipment.

One of the more efficient ways of achieving this cooperation is through cooperative educational programs, with the students gaining theoretical knowledge of crystal technology and related disciplines in the classroom, and practical hands-on skill development on a job. A second option is a strong tuition-refund program established by a company. This might include specific courses selected by engineering personnel and required for the worker to qualify for the refund. A third option is the establishment of an in-house apprenticeship program. The suggested practical experience and new components of the curriculum are easily handled in-house by means of classes taught by appropriate professional personnel, and the engineering and technical curriculum components provided in evening classes at local educational institutions, with the sponsoring company paying tuition. Students work in jobs related to crystal manufacturing.

Models for all these options exist. For example, Northeastern University's "co-op" program, involving alternating twelve week periods of class attendance and twelve week periods of paid work assignments in industry, has been achieved by a close cooperation of the university and the industrial community. Tuition refund programs, the second option, are common in many industries. General Electric's apprenticeship program based in Lynn, Massachusetts provides a model for the third option.

## Conclusion

If the use of crystal technology in the solar energy industry develops as anticipated, jobs will be created for a wide range of skilled workers and technicians. The interrelationships between these skilled jobs and technician openings create a well-defined career ladder on which the skilled worker can advance through technician positions into management, engineering, or sales functions, with increasing job responsibility and salary levels. It is important that curriculum planners stay abreast of developments in this area so that programs can be implemented in time to meet demand for these occupations.

## HOUSING REHABILITATION SPECIALIST

*Skilled*

### Job Description

A Housing Rehabilitation Specialist provides technical advice to community residents on all phases of housing rehabilitation: advising on local housing codes, construction and rehabilitation techniques, and methods and sources of financing rehabilitation. The rehabilitation specialist acts as the facilitator for the four principal participants in the rehabilitation process: the homeowner, the contractor, the financing agency, and the community development program. The rehabilitation specialist relates to community groups, explaining a program and how it interfaces with a total community development program. The specialist follows each project from initial discussion through to final sign-off, keeps records and ensures proper coordination of all phases of the rehabilitation project.

### Summary Assessment

Two social and economic trends have prompted increased housing rehabilitation in recent years. The federal moratorium on housing programs in the spring of 1973 left virtually no federal subsidies for new private housing construction. Lack of subsidies coupled with a recessionary trend of tight capital reserves and high interest rates has caused a sharp decrease in housing starts in the last few years. A separate but related trend in recent years has been an emphasis on stabilizing residential neighborhoods and preserving the existing housing stock. Many urban and suburban communities are beginning to believe that one of their greatest assets lies in structurally sound homes and that encouraging people to invest in their homes will help to solidify a community.

The Housing and Community Development Act of 1974 combined many categorical funds into Community Development Block Grant funds the use of which was left to the discretion of the municipality. According to Department of Housing and Urban Development reports, the top priorities of communities in utilizing these funds have been "conservation and expansion of the housing stock" and "prevention of slums and blight."[1] About 67% of the total funding to metropolitan areas is aimed at achieving these objectives.

As of 1974, eighty-three cities were planning on operating housing rehabilitation programs with four primary sources of supplemental or direct funding:

- Local or State public tax revenues (44 municipalities)
- Local banks (19 municipalities)

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[1] Community Development Block Grant Program, First Annual Report, Executive Summary (Washington, D.C.: Department of Housing and Urban Development, December, 1975).

- Model Cities (17 municipalities)
- Foundations (3 municipalities).[1]

An estimate of ten to fifteen rehabilitation specialists per program results in the current employment of about 1,000 rehabilitation specialists. Most of such programs are expanding, and many are unable to find qualified personnel.

The trends that have created an emphasis on housing rehabilitation should be closely monitored to give a clearer estimate of the future need for rehabilitation specialists. Municipal concern for conservation of the housing stock is not an area that will be ignored in the immediate future, but the scope of programs such as these is largely dependent on the availability of Federal and State funds. It is impossible to project accurately the future form of housing funds.

### Employers and Occupational Setting

The primary employer is municipal government, within either a housing or community development agency. Local housing authorities may be significant employers if their activities include rehabilitation. There also may be opportunities for persons with these skills to work in State government or with private realtors, developers or banks.

Funds for rehabilitation programs obviously will have a direct effect on openings for rehabilitation specialists. Besides Community Development Block Grant funds, other sources of funds have been tapped for rehabilitation programs, including:

- Federal rehabilitation funds (Section 312 of the Housing Act of 1954, soon to expire)
- State and local bond programs
- Other State and local public funds
- Local banks
- Private foundations.

### Student Considerations

Ideally, a rehabilitation specialist should have previous work experience in construction, real estate, finance, or possibly community organization and development. However, a person with no job experience in these areas could be placed as an assistant to a rehabilitation specialist after completing the curriculum.

A significant part of the job entails work in the field, and extensive communication with the parties involved in the rehabilitation procedures.

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[1] Department of Community Planning and Development (HUD), Examples of Local and State Financing of Property Rehabilitation Program Guide No. 1 (Washington, D.C.: Department of Housing and Urban Development, 1974).

The work can be rewarding, in that the result is in a tangible form - in a renovated home or even in a rejuvenated community.

Wage scales tend to be quite good, although previous work experience in a related area is a key factor in determining salary. Entry-level salaries are between $10,000 and $11,000, and there is a normal progression through Senior Rehabilitation Specialist, Principal Rehabilitation Specialist, and Financial Advisor. The top salary in this area would range from $16,000 to $18,000.

There is also good potential for job mobility, especially moving to private sector work in construction companies, real estate firms, and financial institutions. In the public sector, the skills learned in this position could be transferred to other positions within State and local housing agencies or community development agencies.

The licensing of housing rehabilitation specialists would be appropriate, and perhaps similar to that which is presently required for housing or building inspectors. Training programs also should meet some minimal standards to ensure that basic skills are covered. The National Association of Housing and Redevelopment Officials has expressed some interest in promoting training for this position and might be an appropriate certifying agency.

### Curriculum Guidelines

Some local housing agencies are beginning to offer their own educational and training programs in housing rehabilitation. Typically, they are of a few weeks to a few months duration and cover essential areas only superficially.

An adequate housing rehabilitation curriculum should have four major components: construction and rehabilitation, real estate, finance and community organization/community development. It is envisioned that the curriculum would be one to one and a half years duration, and the ideal setting would be a program under the auspices of a community college working closely with the local rehabilitation agency. Components of the curriculum would also provide a useful upgrading function for employed rehabilitation specialists.

The performance objectives and content areas of the four major topics are expressed in the following chart:

Real Estate

Objective: The student will demonstrate the ability to assess the present and anticipated future value of property, and to ensure that anticipated structural changes will be in conformance with zoning regulations.

Topics:
- Property assessment practices
- Zoning regulations
- Infrastructure assessment (water, sanitary sewer, roads, etc.)

Finance

Objective: The student must demonstrate knowledge of the methods of financing rehabilitation, and rehabilitation costs.

Topics:
- Accounting/recordkeeping
- Sources and types of funding
- Loan negotiation/mortgages
- Contract law

Community Organizational/Community Development

Objective: The student will demonstrate the ability to explain construction and financial matters to the homeowner and to explain a program and its interface with a total community development program to the community.

Topics:
- Group dynamics/organization
- Community social structure/social class
- Promoting citizen participation
- Organization of municipal government

| Construction and Rehabilitation |
| --- |
| Objective: The student will demonstrate the ability to assist in the preparation of plans and specifications for remodeling work, and confer with architects, contractors and builders as to methods of construction and material application. |
| Topics: Local housing codes<br>Assessing structural repairs<br>Construction technology<br>Housing design/architectural renovation |

After completion of course work and a field placement to integrate classroom training with practical job experience, the graduate would receive a certificate attesting to successful completion of the curriculum.

### Information for Program Planning

The uniqueness of the housing rehabilitation curriculum is that it combines some skills from many different fields, rather than offering preparation in a completely new discipline. The main areas described in the curriculum are offered in some form at most community colleges, and it is merely a question of combining courses into one program and restructuring some coursework so that it is more directly related to housing rehabilitation. The local rehabilitation agency should be closely consulted on questions of constructing the curriculum, and in some cases the local rehabilitation agency may contract for the education and training of potential employees.

### Conclusion

The housing rehabilitation specialist is an important component of a successful housing rehabilitation program because this person ensures that all the steps in housing rehabilitation are successfully completed. However, employment opportunities are dependent on a municipality's emphasis on housing rehabilitation, which in turn depends on the availability of funds to finance such programs. Federal legislation and appropriations bear monitoring to assess the level of funding upon which job openings legally depend.

Previous experience in a related area is highly regarded by employers. The occupation is well-paying, and job experience provides potential for upward mobility or for mobility into related areas. Program planners should co-ordinate closely with local rehabilitation programs to ensure that a curriculum meets the needs of local rehabilitation programs.

## PUBLIC SAFETY COMMUNICATIONS OPERATOR

*Skilled*

### Job Description

Public Safety Communications Operators receive incoming messages, and dispatch appropriate personnel, most often in emergency situations. Operators may respond to and/or transmit messages on equipment ranging from the simple teletype machine to technologically-advanced computer-assisted communications equipment. Typically the operator deals with people who are in intense stress situations.

### Summary Assessment

It is clear that there is a National concern for intensified public safety measures, and within this general field the communication operator is critical. Estimates of demand and projected growth for this occupation may be extrapolated from the following indicators.

There is an increase in the use of technologically advanced equipment for public safety communications in municipalities and States. A 1971 survey[1] indicated that 39% of 498 police departments were using computers and 69.8% of cities over 100,000 in population had computer-assisted public safety operations. It is predicted that 74% of police departments will be using some form of computer by 1977. All cities of over 500,000 in population now use computers. (Within the four geographical sections of the United States, the Northeast makes the least use of computers at the present time.)

A survey conducted by the Associated Public-Safety Communications Officers, Inc. (APCO) and reported in the journal of the association in March 1973 indicated that some 4500 communications operator positions were unfilled at that time. Data on current or projected numbers of job openings are conflicting. In the departments surveyed there was practically no turnover of personnel; on the other hand, APCO projects a National turnover rate of 25%. Even in the larger cities the number of dispatchers in proportion to the number of people dispatched is small, and there are no departments in the country employing more than 100 dispatch personnel in all ranks. However, the clear trend towards the use of sophisticated equipment points up the need for retraining of currently employed personnel who could benefit from one or more of the units of the curriculum. Finally, most communication operators throughout the country are approaching middle age, indicating a demand for replacement of this personnel in the foreseeable future.

This occupation provides an obviously needed social function, serves an emerging societal need, and is responding to new technological

---

[1] "Use of Computers by Police: Patterns of Success and Failure," Urban Data Service, Vol. 4 (April, 1972).

### Employers and Occupational Setting

Communications operators work within a variety of settings, some of which are themselves new and emerging. These include:

- Universal Emergency Telephone Number (911) System
- National Law Enforcement Teletype System (NLETS)
- National Criminal Information Center (NCIC)
- Centralized fire, emergency medical, and law enforcement facilities
- Emergency Medical Services (EMS)
- Transport and related systems
- Intercity and interstate public safety interfaces
- Comprehensive integrated regional systems such as the United States Forest Service.

Public safety communications operators are employed by local and State police departments, fire departments, emergency medical services, transportation systems, the U. S. Forest Service, and in other publicly funded settings where dispatch of personnel or allocation of mobile resources is required. There is a National trend towards integration of all public communications within specified geographical areas, and a growing recognition of communications as a specific category of civil service, like the police or fire departments.

Employers may relate to a variety of associations for personnel recruitment and/or certification. The Associated Public Safety Communications Officers, Inc. is the major group to which communications operators belong, although usually at the supervisory levels. Regional criteria will determine other relationships, for example, civil service requirements, local police or firemen's unions, certification by state educational boards, or certification by independent agencies.

### Student Considerations

Communications operators must have normal sight, hearing and manual dexterity. They must be able to work well and cooperatively under stress. They must be able to memorize and retain complex information. There are no sex restrictions (women are gaining entry level jobs in this area throughout the country); there are also employment possibilities for rehabilitated ex-inmates depending upon local public policy. People whose handicaps do not relate to the requirements cited above are employable.

Although there is a trend toward the employment of civilians as communications operators, many police departments do not employ dispatchers

who are not sworn members of the police force. With emerging technologies and the increased use of civilians to free police personnel needed on the beat, this restriction may disappear.

Although the work performed often demands specific knowledge of a particular setting (for example, a dispatcher in a fire alarm center cannot now transfer to the police setting without further training) the similarities of the operations performed in the various fields of public safety are far greater than their diversity. With experience, a public safety communications operator may advance from dispatcher to unit supervisor, to chief, and even commissioner or director of public safety. Depending upon the degree of education and experience, these operators can also move laterally to equivalent settings, for example, from a police unit to a 911 system, which deals with a wider range of emergency situations. Therefore, there are opportunities for interoccupational mobility, the transfer of skills learned from setting to setting, job advancement, and average to good wage scales comparable to civil service scales or negotiated union contracts. These entry-level salaries range from a low of $8,000 to as high as $12,000.

Communications operators work extremely closely with other members of a team in a continual environment of stress. There is distracting intermittent noise, often in close quarters. Each operator must be able to perform a backup function for every other member of the team, and for successful operations the team must function as an interdependent unit. In some settings there are periods of intense activity alternating with periods of relative quiet. Sometimes operators work a 10-14 hour shift, and in a few situations are required to live in the center for four or more days at a time.

It is suggested that midway through the preparatory program after exposure to a variety of public safety settings, a preliminary decision should be made by the student with the help of the instructional and counseling staff regarding the student's ability to work under stress. Every opportunity should be given a student to "select out" of a career in public safety communications while allowing that student to pursue a career in another part of the communications field. Subsequently, students should be provided with sufficient information regarding the job opportunities within various public safety settings to match these with their own job preferences.

### Curriculum Guidelines

Of special interest to educational planners is the wide demand for educational and training programs for this occupation. Typically, preparation is conducted on the job and is so specific to the particular setting that operators have no opportunity for interoccupational mobility. The introduction of new technologies, coupled with the growing recognition of communications as a vital component of the public safety complex, has created a variety of unsatisfactory attempts to help operators adjust to new job responsibilities and/or techniques. Most of these attempts, such as the development of "home-study cassettes," or one-week refresher

courses, are being made without consultation with the State or local educational resources. In three States an effort currently is being made by the state police to secure funds to establish a communications academy following the police academy and fire academy model. Although this might be one viable alternative, such preparation can be more properly located within the vocational/technical State institutions where a program containing the educational components listed below could lead to certification, an A.S. degree, or licensure, and prepare students for work in a variety of settings. Therefore, although some components of the suggested program have been offered in an instructional OJT setting, the curriculum is new to most vocational/technical institutions.

Since there is a large demand for refresher courses for currently employed operators, and few resources in the country, the curriculum guidelines discussed below were designed to allow operators who are presently employed to select only certain "refresher" units appropriate to their needs. Other students may enter the occupation after the completion of a two year program, or they may continue their education in preparation for a more advanced occupation in the communications field. The curriculum should be designed so that specific courses can be taken to provide new information or new skills, and also should be designed sequentially so that upon completion of a two year program the student will be accepted as a trained public safety communications operator without significant further expenditure in OJT.

The two-year curriculum should contain topics such as those summarized in the chart below.

| COMPONENTS |
|---|
| Objective: The student will be able to use the psychological skills needed in dealing with people under stress. |
| Topics: Group Dynamics<br>Management and leadership skills<br>Good administrative practices<br>Logical reasoning<br>Psychology of handling people under stress<br>Stress performance simulation exercises<br>Listening and learning |
| |
| Objective: The student will demonstrate an understanding of the evolution and organization of public safety systems. |
| Topics: Development of U.S. Public Safety Systems<br>Organization of Public Safety Systems within States |

| COMPONENTS (continued) | |
|---|---|
| Objective: The student will demonstrate an understanding of the laws and regulations governing public safety communications. | |
| Topics: | FCC regulations<br>Local statutes<br>State regulations<br>Legal implications of faulty communications practice |
| Objective: The student will demonstrate thorough knowledge of the community. | |
| Topics: | Social, economic, demographic characteristics of local communities<br>Political structure<br>Geography |
| Objective: The student will demonstrate technical competence in modes of communications, recordkeeping, and data storage/retrieval systems. | |
| Topics: | Training in memory, rapid serial activities, correct voice techniques<br>Special idioms, phonetic alphabets, special codes<br>Recordkeeping<br>Basic theory relating to equipment; teletype, telephone, radio, computer technology<br>Transmission techniques for above equipment<br>Rudimentary emergency repair of equipment<br>Data access, retrieval and transmission procedures<br>Licensing requirements and fulfillment of these for certification |

Practical experience for those in the public safety communications field is crucial: the effective performance of the Communications Operator is often a matter of life or death. No amount of academic or technical education can satisfy the realistic requirements of potential employers that operators have practical hands-on experience in serious stress situations. Through simulation, observation and short-term placement in a variety of public safety settings, the program must provide the student with opportunities to test each part of the curriculum in reality situations. At least 25% of the total curriculum should be conducted in the field.

## Information for Program Planning

It is of critical importance that new programs for public safety communication operators be developed with the close cooperation and sanctions of the top representatives in the public safety field. Whether on the State or local level, a curriculum should be designed in continued consultation with the prospective employers, i.e., the representatives from the public safety sector who have been delegated by the commissioner, superintendent, or chief to assure that the curriculum is relevant to public safety needs. Particularly because preparation for this occupation has traditionally been conducted outside the educational community, educational planners must obtain agreements from public safety personnel that upon completion of the program the communications operators will be employed within the public safety setting. This caveat also implies that in certain regions at least, civil service requirements are considered during the development of the curriculum.

Once support for the pioneer program is obtained the curriculum can be designed by using the talents and cooperation of many people within existing educational divisions, e.g., communications, psychology, sociology, political science, electronics, speech and theatre, working in close cooperation with an advisory group of public safety personnel.

Where sophisticated technological equipment is being used locally, hands-on experience can be obtained by using local computer facilities, simulation techniques, and the practical experience gained in short periods of placement within the public safety sector. Most vocational/technical two-year schools have switchboards, radios and other equipment sufficient for preparation.

## Conclusion

The major ingredient in program implementation is forging good relationships between the educational and public safety community to insure success of the program.

The assumption of responsibility by the educational community for good training of public safety communications operators should not only meet the obvious need of the growing field of public safety, but should also provide a model for increased cooperation between two major public sector areas; i.e., public postsecondary education and public safety.

# APPENDIX

Appendix A

Rejected Occupations

AGRICULTURE

- Certified Fertilizer Applicator

COMMUNICATIONS

- Cable T.V. Technician
- Data Communications Manager

COMPUTERS

- Microprocessor Technician
- Program Librarian
- Small Computer Coder
- Small Computer Operator
- Small Computer Programmer
- Tape Librarian

CONSTRUCTION

- Nuclear Qualified Welder
- Welder
- Underwater Welder
- Welding Machine Operator

CONSUMER AFFAIRS

- Product Liability Technician
- Product Safety Technician

CRIMINALISTICS

- Ballistician
- Paramedic Forensic Scientist
- Criminalistics Technician

ELECTRONICS

- Crystal Polishing Technician
- Scientific Test Equipment Salesperson

ENERGY

- Heat and Power Engineer
- Nuclear Quality Control Technician
- Industrial Security Technician for Nuclear Plants
- Power Reactor Operator
- Refrigeration/Airconditioning Mechanic
- Maintenance Technologist
- Solar Energy Technician

ENVIRONMENT

- Air Pollution Technician
- Pyrolysis Technician
- Chemical Spill Control Technician
- Sediment Control Inspector
- Environmental Technician
- Sediment Control Specialist
- Ecological Technician
- Soil Conservation Technician
- Field Associate
- Wastewater Treatment Plant Operator
- Geological Technician
- Wastewater Treatment Plant Technician
- Geophysical Technician
- Water and Wastewater Equipment Technician
- Noise Abatement Technician

HEALTH CARE

- Certified Record Technician
- Industrial Hygienist
- Diagnostic Medical Sonographer (Ultrasound)
- Media Equipment Specialist
- Production Specialist for Instructional Technology
- Dialysis Technologist
- Emergency Medical Technician
- Safety Technician (OSHA)
- Fundus Photographer
- Utilization Review Coordinator
- Health Technician

LABORATORY

- Chromatography Technician
- Kirlian Photographer
- Nuclear Test Technician
- Physical Science Technician
- Tissue Culture Technician

LAW ENFORCEMENT

- Public Safety Communications Officer
- Public Safety Communications Technician

MEDICINE

- Paraprofessional Optometrist

NATURAL RESOURCES

- Mineral Exploration Technician

QUALITY CONTROL

- Holography Technician
- Loss Control Technician
- Quality Control Technician
- Standards and Calibration Technician

SECURITY

- Fire Prevention Equipment Installation Technician
- Industrial Security Investigator
- Industrial Security Operations Manager
- Physical Security System Technician
- Security Officer
- Security Officer for Transportation Centers

SOCIAL SERVICES

- Activities Director
- Community Development Officer
- Community Improvement Estimator
- Community Transition Coordinator
- Director, Halfway House
- Halfway House Job Developer/ Vocational Counselor
- Halfway House Paraprofessional Counselor
- Halfway House Operations Supervisor
- Homemaker/Home Health Care Worker
- Manager, Halfway House
- Middlemanager, Halfway House
- Mental Health Associate
- Vocational Coordinator
- Youth Service Counselor, Resident
- Youth Service Counselor, Non-resident

TRANSPORTATION

- Airport Planner
- Airport Certifier
- Diesel Mechanic
- Marina Operator
- Rail Car Repairman

Appendix B

GLOSSARY

A. General

ADVOCATE

One who represents a client's interests or advises as to rights, privileges, or services to which a client is entitled in a variety of situations.

APPRENTICESHIP

A period during which a person works for an employer or a master craftsman in order to learn vocational skills.

See Also: FIELD PLACEMENT IN-SERVICE TRAINING

ASSISTANT or AIDE

A person in an employment environment subordinate to another in rank or technical experience, who performs a support function in carrying out a common task.

See also: PARAPROFESSIONAL, TECHNICIAN, TECHNOLOGIST

ASSOCIATE DEGREE

A diploma granted to a student upon completion of an educational course of two years' duration at the postsecondary level.

See also: LICENSE, CERTIFICATE, REGISTRATION

AUTOCLAVE

A closed apparatus used for sterilizing objects by means of steam under high pressure.

BIOMECHANICS

The study of the construction and functions of orthotic and prothetic devices.

See also: ORTHOTIC, PROSTHETIC

BLOCK GRANT FUNDS

Public funds which are appropriated for broad functional areas, rather than for specific programs

See also: CATEGORICAL FUNDS

CATEGORICAL FUNDS

Public funds which are earmarked for specific programs.

See also: BLOCK GRANT FUNDS

CERTIFICATE

A document attesting to the completion of an educational course.

See also: LICENSE, ASSOCIATE DEGREE, REGISTRATION

COOPERATIVE PROGRAM (CO-OP)

A form of education in which the student alternates periods of classroom study with periods of related work experience.

See also: APPRENTICESHIP, IN-SERVICE TRAINING, FIELD PLACEMENT, PRACTICAL EXPERIENCE.

CORE COURSES

A group of courses dealing with subject matter common to several related specialties, offered prior to specialization.

See also: TRAINING OPTION

DEMAND ESTIMATE

The number of openings in a particular job classification which employers would actually fill if qualified workers were available.

See also: NEED ESTIMATE

ENABLING LEGISLATION

Legislation giving legal power or sanction to a designated party for any specified purpose (e.g., The Juvenile Justice and Delinquency Act of 1974 authorized the states to provide services to runaway youth, and appropriated funds for this purpose).

ENTRY LEVEL

A position which requires no previous work experience in that field.

FIELD PLACEMENT

The assignment of a student to an employment position with or without pay, where experience gained serves educational purposes.

See also: APPRENTICESHIP, COOPERATIVE PROGRAM, IN-SERVICE, PRACTICAL EXPERIENCE

HANDS-ON EXPERIENCE

Learning by doing, either in a work environment or a classroom environment which simulates the work environment.

IN-SERVICE TRAINING

Training which takes place while a paid employee is working on the job.

See also: APPRENTICESHIP, FIELD PLACEMENT, OJT

INTERFACE

The common ground (facts, problems, considerations, theories, practices) shared by two or more disciplines, procedures, or fields of study.

LICENSE

A document of qualification which authorizes an individual to engage in a business, profession, or other activity.

See also: ASSOCIATE DEGREE, CERTIFICATE, REGISTRATION

NEED ESTIMATE

The number of potential job openings in a particular occupation, as contrasted with actual job openings availalbe.

See : DEMAND ESTIMATE

NON-TECHNICAL

As applied to curriculum, components, other than mathematical and scientific and/or components which are necessary but not job-specific.

See also: TECHNICAL

OCCUPATIONAL MOBILITY: LATERAL

The ability to leave the job for which one has been trained and move into a related employment area with similar salary and responsibilities.

See also: OCCUPATIONAL MOBILITY: UPWARD

OCCUPATIONAL MOBILITY: UPWARD

The ability to move up from the job for which one has been trained into a position requiring a higher skill or work responsibility.

See also: OCCUPATIONAL MOBILITY: LATERAL

OJT

On-the-job training or training gained through work experience.

ORTHROTIC DEVICE

Any corrective device for the body, such as eyeglasses, leg brace, and so forth.

See also: BIOMECHANICS, PROSTHETIC DEVICE

PARAPROFESSIONAL

An individual who, as the result of a restructuring of the work formerly performed by professionals, carries out certain functions and services in a given professional field.

See also: ASSISTANT, TECHNICIAN, TECHNOLOGIST

PRACTICAL EXPERIENCE

The part of an educational course consisting of APPLIED work experience in an employment setting.

See also: COOPERATIVE PROGRAM, FIELD PLACEMENT

PRIVATE SECTOR

Non-government employers.

See also: PUBLIC SECTOR

PROSTHETIC DEVICE

An artificial replacement part added to the body (such as an artificial limb or false teeth), to compensate for the loss of the original part.

See also: BIOMECHANICS, ORTHOTIC DEVICE

PUBLIC SECTOR

Government employers.

See also: PRIVATE SECTOR

QUALITY ASSURANCE

A set of principles and procedures by which one evaluates a system (as opposed to a product) to determine the degree to which it adequately assures quality.

See also: QUALITY CONTROL

QUALITY CONTROL

Set of principles and procedures by which one determines whether a given product meets established standards of acceptability. Quality control is one aspect of quality assurance.

See also: QUALITY ASSURANCE

REFRESHER COURSE

A brief course of study serving as a review of previous education or as a review of current developments in an occupation.

See also: UPGRADING COURSE

SEMICONDUCTOR

An electronic device, which allows electricity to flow in only one direction, used in the manufacture of computers.

See also: WAFER

SIMULATION TECHNIQUE

Use of a model which approximates certain environmental or other conditions for the purpose of training.

SKILLED WORKER

A person who has had a few months to a year of vocational education, with a substantial hands-on training component.

See also: TECHNICIAN

SOLAR CELL

A photovoltaic device which converts solar radiation directly into electricity.

SPECIALIST OPTION

A small group of courses within an established curriculum which enables a student to pursue an in-depth study of one aspect of a subject.

See also: TRAINING OPTION

TECHNICAL

As applied to curriculum, mathematical or scientific components and/or components which are job-specific.

See also: NON-TECHNICAL

TECHNICIAN

A person who has had two to three years of post-secondary vocational education, including both theoretical and practical preparation.

See also: SKILLED WORKER

TECHNOLOGIST

A person who applies the branch of knowledge that deals with the industrial arts, applied science, engineering.

See also: ASSISTANT, PARAPROFESSIONAL TECHNICIAN

TECHNOLOGY

The practical implementation of industrial arts, applied science, and engineering.

TRAINING OPTION

One component in a specialty area for selection by a student, after completion of core courses common to all specialty areas in an educational program.

See also: CORE COURSES, SPECIALIST OPTION

UPGRADING COURSES

A course of study enabling an employee to improve work skills, leading to a greater level of competence or responsibility.

See also: REFRESHER COURSE

V.O.M.

Volt-ohm meter, a standard electric measuring device.

WAFER

A thin slice of crystalline materila, used in the manufacture of semiconductors.

See also: SEMICONDUCTOR

Appendix C

## SOURCES OF INFORMATION

CHILD ADVOCATE

Sources of Information

Individuals from the following institutions were contacted:

Massachusetts Department of Youth Services, Boston, Massachusetts

American River Community College, Sacramento, California

Golden West College, Huntington Beach, California

National Council on Crime and Delinquency, Washington, D.C.

Youth Service Bureaus, White Plains, New York

California Youth Authority, Sacramento, California

Office of Community-Based Treatment, Harrisburg, Pennsylvania

Southern Regional Educational Board, Atlanta, Georgia

Children's Defense Fund, Boston, Massachusetts

Massachusetts Department of Mental Health, Boston, Massachusetts

Help for Children Program, Massachusetts Office for Children, Boston, Massachusetts

Berkeley Planning Association, Berkeley, California

Massachusetts Advocacy Center, Boston, Massachusetts

Bureau of Special Education Appeals, Massachusetts State Office of Education, Boston, Massachusetts

Federation for Children with Special Needs, Boston, Massachusetts

Columbia Point Youth Advocacy Program, Boston, Massachusetts

Regional Center for the Developmentally Disabled, Orange County, California

Sonoma County Citizen Advocacy Project, Santa Rosa, California

Boston Youth Activities Commission, Boston, Massachusetts

Office of Juvenile Justice, Law Enforcement Assistance Administration, Washington, D. C.

Massachusetts Youth Activities Commission, Boston, Massachusetts

Publications

"A Core Curriculum for Entry and Middle Level Workers in Human Services Agencies." Report prepared by the Human Services Manpower Career Center. Washington, D.C.: U.S. Department of Labor, June, 1971.

Harvard Educational Review "The Rights of Children - Part I" Vol. 43, November, 1973

Harvard Educational Review "The Rights of Children - Part II" Vol. 44, February, 1974

CRYSTAL MANUFACTURING

Sources of Information

Individuals from the following institutions were contacted:

Rockwell International Inc., Micro Electronics Group, Anaheim, California

Mobil-Tyco Solar Energy Corp., Waltham, Massachusetts

Fairchild Instruments, Inc., Mountain View, California

General Diode Corp., Framingham, Massachusetts

Crystal Systems, Inc., Salem, Massachusetts

Texas Instruments, Dallas, Texas

Engineering Solar Power Corp., Wakefield, Massachusetts

Publications

"Photovoltaics: Photons In/Electrons out." Mosaic, Vol. No. 5 5 (Spring, 1975).

"ERDA's Photovotaic-cell effort kicks off with procurement, research." Electronics, November 13, 1975.

"The semiconductor becomes a new marketing force." Business Week, August 24, 1975.

"Electronic metals recover to new heights." Chemical and Engineering News, July 23, 1973.

Lincoln College Catalog. Northeastern University, Boston, Massachusetts.

Brooking, Walter J., ed. Career-Opportunities-Engineering Technicians Chicago: J. G. Ferguson, 1975.

Occupational Outlook Handbook, 1974-1975. U.S. Department of Labor, 1975.

"Texas Instruments: Pushing hard into the consumer markets." Business Week, August 24, 1975.

ENERGY EFFICIENCY TECHNICIAN

Sources of Information

Individuals from the following organizations were contacted:

Energy Research and Development Administration (ERDA), Washington, D.C.

Federal Energy Administration (FEA) Washington, D.C.

National Bureau of Standards (NBS), Washington, D.C.

Bureau of Labor Statistics (BLS), Washington, D.C.

MASSPORT, Boston, Massachusetts

Henry Ford Community College, Dearborn, Michigan

Stone and Webster, Boston, Massachusetts

Resource Planning Associates, Cambridge, Massachussetts

Renaissance Center Management Corp., Detroit, Michigan

Leo A. Daley Company, Omaha, Nebraska

Westinghouse Electric Company, Pittsburgh, Pennsylvania

Gamze, Korobkin, Callager, Inc., Chicago, Illinois

Publications

"A Million Jobs with No Takers." Business Week, January 19, 1976.

Profiles of Energy Conservation Programs. FEA, 1975.

HALFWAY HOUSE RESIDENT MANAGER

Sources of Information

Individuals from the following institutions were contacted:

Regional Institute of Community Residential Treatment Centers,
Saint Louis University, St. Louis, Missouri

International Halfway House Association, Cincinnati, Ohio

Seattle Community College, Seattle, Washington

Alston Wilkes Society, Columbia, South Carolina

Massachusetts Residential Programs, Cambridge, Massachusetts

Massachusetts Halfway House Inc., Boston, Massachusetts

Office of Regional Operation, Law Enforcement Assistance Association, Washington, D.C.

Publications

Cost Analysis of Correctional Standards: Halfway Houses, Washington, D.C.: Correctional Economics Center of the American Bar Association, November, 1975.

Directory, Residential Treatment Centers 1975-1976, Cincinnati, Ohio: International Halfway House Association. 1975

HORTICULTURAL THERAPY AIDE

Sources of Information

Individuals from the following organizations were contacted:

Welwood Horticultural Training Center, Upper Marlboro, Maryland

Bancroft Community, Haddenfield, New Jersey

Home of Guiding Hands, Lakeside, California

Menninger Clinic, Topeka, Kansas

New York University Hospital, New York, New York

Department of Horticulture, Texas Technical University, Lubbock, Texas

Department of Horticulture, University of Florida, Gainesville, Florida

Department of Horticulture and Forestry, Kansas State University, Manhattan, Kansas

Horticulture Department, University of Maryland, College Park, Maryland

Longwood Program in Ornamental Horticulture, University of Delaware, Newark, Delaware

Department of Horticulture, Clemson University, Clemson, South Carolina

Biology Department, Charles County Community College, La Plata, Maryland

Iowa Lakes Community College, Emmetsburg, Iowa

Biology Department, Bergen Community College, Paramus, New Jersey

Bronx Botanical Garden, New York, New York

Department of Horticulture, Michigan State University, East Lansing, Michigan

Department of Human Kinetics and Leisure Studies, George Washington University, Washington, D.C.

Division of Agriculture and Natural Resources, State University of New York at Cobleskill, Cobleskill, New York

B.E.H. Community College Curriculum Development Project in Therapeutic Recreation, University of Illinois, Champaign, Illinois

Department of Plant Science, University of Rhode Island, Providence, Rhode Island

National Council for Therapy and Rehabilitation through Horticulture, Mount Vernon, Virginia

American Occupational Therapy Association, Rockville, Maryland

American Horticultural Society, Mount Vernon, Virginia

National Therapeutic Recreation Society, Arlington, Virginia

American Hospital Association, Chicago, Illinois

Horticultural Hall, Boston, Massachusetts

Publications

Acquaviva, Francis A. "AOTA Human Resources Project." American Journal of Occupational Therapy, Vol. 29, March through August, 1975.

"A Planning Project for Post-Secondary Vocational Educational Opportunities for the Handicapped." Charles County Community College, La Plata, Maryland, and Melwood Horticultural Training Center, Inc., Upper Marlboro, Maryland. 1975.

Barber, Andrew. "Interest in Horticultural Therapy." The Menninger Foundation, undated.

Barber, Andrew. "Horticultural Therapy," undated paper.

Graham, Milton D. and Robinson, Robert L. 851 Blinded Veterans: A Success Story. American Foundation for the Blind, 1968.

Health Careers Guidebook. Third edition. Published jointly by Department of Labor, Manpower Administration and Department of Health, Education and Welfare, National Institutes of Health, 1972.

Health Manpower Resources, Report No. 1. Preliminary Tabulations from the Survey of Health Manpower in Hospitals. Public Health Service, Bureau of Health Professions Education and Manpower Training, July, 1970.

Health Resources Statistics. National Center for Health Statistics, 1974. (HEW publication 75-1509)

Hefley, Paula D. "Planting New Seeds." Performance, Vol 23, February, 1973.

Hunter, Nora Louise. "Horticulture Programs in Prisons." Paper written for California State Polytechnic College, San Luis Obispo, 1970.

Kinsinger, Robert E. Career Opportunities for Technicians and Specialists: Health Technicians. Chicago: J.G. Ferguson Publishing Co., 1970.

McCandliss, Rhea R. "Horticultural Therapy as a Profession." Topeka, Kansas: The Menninger Foundation, 1969.

_____"The Plant-Man-The Environment." Paper presented October 3, 1967, at the Menninger Foundation.

_____"Horticultural Therapy as a Therapeutic and Hospital Program." Undated paper.

_____"Results of Survey on Horticultural Therapy." Unpublished paper, July 1968.

Occupational Manpower and Training Needs, Revised 1974. Department of Labor, Bureau of Labor Statistics, 1974. (Bulletin 1824)

Occupational Outlook Handbook (1974-1975). Washington, D.C.: U.S. Department of Labor, 1975.

Plankinton, Herbert. Horticulture as a Work Program for Therapy. Unpublished Masters Thesis, University of Delaware, 1973.

Rosenblum, Sidney; Przybyl, Casimir; and Buoniconto, Pasquale. " A Survey of Farm and Dairy Operations in Institutions for the Mentally Retarded." American Journal of Mental Deficiency, 64, (July, 1959) pp 356-365.

"Training Program at the Menninger Foundation for Horticultural Therapy Students in Cooperation with Kansas State University." The Menninger Foundation. June 7, 1973.

HOUSING REHABILITATION SPECIALIST

Source of Information

Individuals from the following organizations were contacted:

National Association of Housing and Redevelopment Officials, Washington, D.C.

Housing Assistance Council, Washington, D.C.

Boston Redevelopment Authority, Boston, Massachusetts

Rehabilitation Division of St. Paul Housing Authority, St. Paul, Minnesota

Community Planning and Development, Department of Housing and Urban Development, Washington, D.C.

Housing Services Department, Portland Development Commission, Portland, Oregon

Department of Housing and Community Development, Baltimore, Maryland

Special Assistant for Citizen Participation to the Assistant Secretary for Community Planning and Development, Department of HUD, Washington, D.C.

Publications

HUD News. Washington, D.C.: U.S. Department of Housing and Urban Development, January 8, 1976.

Community Development Block Grant Program, First Annual Report, Executive Summary. Washington, D.C.: Department of Housing and Urban Development, December, 1975.

Department of Community Planning and Development (HUD). Examples of Local and State Financing of Property Rehabilitation Program Guide No. 1. Washington, D.C.: Department of Housing and Urban Development, 1974.

INDUSTRIAL HYGIENE TECHNICIAN

Sources of Information

Individuals from the following organizations were contacted:

Human Factors Section, Eastman Kodak Health and Safety Laboratory, Rochester, New York

College of Medicine, University of Iowa, Oakdale, Iowa

Corporate Industrial Hygiene, Polaroid Corp., Cambridge, Massachusetts

North Shore Community College, Beverly, Massachusetts

Cedar Rapids Community College, Cedar Rapids, Iowa

Stanford Research Institute, Washington, D.C.

American Industrial Hygiene Association, Akron, Ohio

Division of Training and Manpower Development, NIOSH, Cincinnati, Ohio

Harvard School of Public Health, Cambridge, Massachusetts

Occupational Safety and Health Administration, Washington, D.C.

Publications

Health and Work in America: A Chart Book. Washington, D.C.: American Public Health Association, 1975.

Occupational Outlook Quarterly, Spring, 1975. Department of Labor, Bureau of Labor Statistics.

Galukner, Terrence W. "The IE and ESHA." Industrial Engineering, May, 1975, pp. 26-30.

Berry, Clyde M. "What is an Industrial Hygienist?" National Safety News, August, 1973, pp. 69-75.

"Industrial Hygiene Manpower." American Industrial Hygiene Association Journal, June, 1975, pp. 433-446.

Occupational Safety and Health Reporter, The Bureau of National Affairs, Washington, D. C. 1971.

NUCLEAR QUALITY ASSURANCE INSPECTOR

Sources of Information

Individuals from the following institutions were contacted:

Stone & Webster, Boston, Massachusetts

American Society for Quality Control, Milwaukee, Wisconsin

Rurns & Roe, Commack, New York

National Laboratories, Argonne, Illinois

Babcock & Wilcox, Barberton, Ohio

American Society for Quality Control, Milwaukee, Wisconsin

United Engineers, Philadelphia, Pennsylvania

Leeds & Northrup, Philadelphia, Pennsylvania

Nuclear Regulatory Commission, Washington, D. C.

Directorate for Science Education, National Science Foundation, Washington, D. C.

Technical Education Research Corporation, Southwest Center, Waco, Texas

Energy Research and Development Administration, Washington, D.C.

Industrial Psychology and Management, University of Tennessee, Knoxville, Tennessee

Training and Technology Program, Oak Ridge Associated Universities, Oak Ridge, Tennessee

Tennessee Valley Authority, Knoxville, Tennessee

Arnold Greene Testing Labs, Natick, Massachusetts

Publications

Griffith, W.F. "How to Implement Quality Training Programs: QA/QC Personnel Training." Paper delivered at the Second Annual Conference of Nuclear Power, October, 1975.

Hull, Dan. "Quality Assurance/Quality Control Technician." Unpublished curriculum for QA/QC technician, combining tester, auditor, and inspector training.

PODIATRIC ASSISTANT

Sources of Information

Individuals from the following institutions were contacted:

American Association of Podiatric Assistants, Waco, Texas

American Academy of Podiatric Sports Medicine, Hayward, California

American Podiatry Association, Washington, D.C.

California Association of Podiatric Assistants, San Francisco, California

Council on Education, American Podiatry Association

Pennsylvania College of Podiatric Medicine, Philadelphia, Pennsylvania

Jefferson Community College, Louisville, Kentucky

Essex Community College, Baltimore County, Maryland

Publications

"Athlete's Feet." Runner's World Magazine, December, 1974.

Goldstone, Harold, and Horowitz, Morris. Restructuring Paramedical Occupations. Paper prepared for the U.S. Department of Labor. January, 1972, and other publications.

Health Careers Guidebook, Third Edition, Department of Labor and Department of Health, Education and Welfare, Washington, D. C., 1972.

Occupational Manpower and Training Needs, Revised. Department of Labor, Bureau of Labor Statistics, Washington, D. C. 1974.

Occupational Manpower and Training Needs. Bureau of Labor Statistics, 1974.

"Shoes for Runners." Runner's World Magazine, July, 1973.

College Catalogs from:

Essex Community College, Baltimore County, Maryland

Jefferson Community College, Louisville, Kentucky

Pennsylvania College of Podiatric Medicine,
Philadelphia, Pennsylvania

PUBLIC SAFETY COMMUNICATIONS OPERATOR

Sources of Information

Individuals from the following institutions were contacted:

The Associated Public-Safety Communications Officers, Incorporated
New Smyrna Beach, Florida

Booz, Allen and Hamilton, Bethesda, Maryland.

Chicago Police Department, Chicago, Illinois.

Department of Public Safety, Omaha, Nebraska.

Electronic Associates, Inc., Rockville, Maryland.

Department of Urban Studies, M.I.T., Cambridge, Massachusetts.

National Training Director, ADT Security Systems, New York, New York

Rand Corporation, Santa Monica, California

Boston Fire Department, Boston, Massachusetts

State University of New York, Albany, New York.

College of Engineering, Florida Technological University, Orlando, Florida.

New Jersey State Police Department, Trenton, New Jersey

Publications

"Automated Alarm Systems Open Up Possibilities for Other Services." Electronic Magazine, November 13, 1975.

Clapp, David E.; and Doering, Robert D. "Orlando Police Department Dispatch Training Simulator." Journal of Public Safety Communications, Vol. 42, pp. 16-24.

Colton, Kent W. "Computer and the Police: Police Department and the New Information Technology." The Municipal Yearbook 1975, Vol. 42, pp. 214-232.

"Data Collection and Computer Analysis for Police Manpower Allocation in Arlington, Ma." Series in Innovative Resource Planning in Urban Public Safety Systems. Department of Urban Stuies, Massachusetts Institute of Technology, Cambridge, Massachusetts

"Solving Urban Location Problems: Human Intuition versus the Computer." Journal of the American Institute of Planners, January 19, 1971, pp. 95-99.

"Use of Computers by Police: Patterns of Success and Failure." Urban Data Service, April, 1972.

"Qualification of Quality Assurance Audit Personnel for Nuclear Facilities." Penultimate draft, American National Standards Institute N 45.2.23, Ray Wachniak, Assigned Correspondent.

Smith, W. R. "Nuclear Construction: Some Difficulties and Challenges." Paper delivered at WAATec Conference, February 21, 1974.

Stovall, Waltrina. "Quality's their Business." Around the System, Con Edison, May, 1975, pp. 7-9.

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"Utility Staffing and Training for Nuclear Power." Atomic Energy Commission June, 1973. (WASH-1130, Revised)

PHYSICAL SECURITY TECHNICIAN

Sources of Information

Individuals at the following institutions were contacted:

American Society for Industrial Security, Washington, D.C.

Private Security Task Force to the National Advisory Committee on Criminal Justice Standards and Goals, McComb, Illinois

American District Telegraph Company, New York, New York

University College, Diector of Law Enforcement Programs, Northeastern University, Boston, Massachusetts

First Security Services Corp., State Street, Boston, Massachusetts

McComb Junior College, McComb, Illinois

Denver Research Institute, Denver, Colorado

Allegheny Community College, Pittsburgh, Pennsylvania

Rand Corp., Santa Monica, California

National Bank of Detroit, Detroit, Michigan

Publications

Academic Guidelines for Security and Loss Prevention Programs in Community and Junior Colleges American Society for Industrial Security, Washington, D.C.: 1972.

"ASIS Survey Results." Security Management, January, 1976.

McClellan, Hassell H. "Note on the Security Services and Equipment Industry." (Harvard Business School #9-374-358)

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